approach

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TECHNOLOGY & SCIENCE

COCKPIT CONFUSION

AT THE DIP

Confusion in any cockpit can be critical, but when chaos rears its ugly head in the cockpit of a helicopter hovering at 40 ft, the results can often be disastrous.

Antisubmarine helicopters operate in the 40 ft, zero-airspeed realm, but this is not the only peculiarity that makes helo ASW flying unique and demanding.

Some of the uniqueness stems from the fact that ASW helo operational flying is done with a sonar dome dipped below the surface of the water. This configuration precludes any sudden maneuvering on the part of the aircraft other than straight up and down. This may be termed the inverted yo yo concept, since the aircraft is tethered to the sonar dome and its movements are dictated by it.

Another unique aspect of helo ASW dipping is the importance of sea state. Because of the necessary "super-sensitivity" of the altitude holding system, heavy swells or a choppy surface can actually induce the chopper to climb and dip consistent with the water's surface. A slick, smooth sea sometimes offers such poor doppler return to the equipment that the aircraft slews and pitches in what is sometimes appropriately termed the "Sikorsky Sleighride." This is quite an adventure at 40 ft on a black night and certainly no time for Old Dame Confusion to show up.

Idiosyncrasies of helo ASW flying can be discussed *ad infinitum*—in short, it's a unique area of naval aviation requiring a special kind of talent and language* (see bottom of page 2).

Let's take a look at a few mishaps where cockpit confusion was present and see if something can be learned for the prevention of similar accidents in the future.

Who's Got The Ball?

During the evolutions involved in most helicopter ASW operations, it is absolutely imperative that there be a thorough understanding of the line of responsibility between the pilot and copilot as to cockpit procedures. Any breakdown in crew coordination, especially in an "extremis" situation, can result in cockpit confusion which will hamper the performance and ability of the entire crew to cope with the problem.

Night instrument "dipping" at altitudes down to 40 ft requires a maximum of pilot proficiency and experience. In this regime, the pilot at the controls has to be continuously on instruments and should an emergency situation develop he has to rely on the copilot to execute the correct emergency procedures while he concentrates on keeping the aircraft flying.

During a night dipping exercise, an SH-3A was dipping while in a hover on cable angle and radar altimeter control. When the transducer could not be raised by the normal method, the crewman started pumping the boom up with the hydraulic ram hand-driven pump and energized the dome seat switch. The aircraft started backing down.

The crewman countered with all his forward drift control to no avail. He asked the pilot for more control. With the copilot on the controls, the pilot increased the speed setting on the ASE control panel from zero to a plus eight kts.

Noting that the aircraft had backed down to 20 ft, the copilot immediately raised collective in an attempt to halt the altitude loss. The aircraft climbed to about 60 ft, then rapidly lost altitude again.

This transition was so rapid and violent that the pilot was unable to get back on the controls until the aircraft was down to 20 ft again. He immediately raised collective to initiate a climb, but the aircraft struck the water and eventually rolled inverted and sank. The crew exited safely.

The primary cause of the accident was that neither pilot recognized the extremely hazardous flight condition until it was too late to initiate abortive action and prevent a collision with the water. The crewman's use of a nonstandard procedure to retract the sonar boom resulted in a generation of conflicting inputs to the auto-hover system. Evidently none of the crew was aware of the deleterious effect of "pumping up the boom."

At the time of the initial altitude loss and subsequent climb to 60 to 80 ft, the pilot's attention was focused on the ASE control panel. When his scan returned to the flight instruments, he noticed the altitude deviation and then attempted recovery. The rate of descent was such that all recovery attempts were futile.

Other such incidents indicate that pilots and air-

Chaos, confusion, and nonstandard procedures can result in an extremely hazardous situation.

crewmen should be briefed on the different methods of raising the sonar dome, the results to be expected from each method, and the relative merits of each method.

The correct procedure for raising a hung dome is by use of the 28-volt DC motor activated by the emergency T handle. As the dome submerge light goes out the cyclic coupler switch should be placed in DOPPLER mode. If the emergency T-handle will not raise the dome, then it may be desirable to have the sonar operator pump up the sonar boom, thus bypassing the micro-switch sequence and raising the hoist by the normal hydraulic system. The hazard here is that when the boom is being pumped up by hand with the aircraft in the CABLE ANGLE mode (as it was in this case), the result may be a strong aft signal on the cyclic. To prevent this "backing down" situation it may be desirable to switch the cyclic coupler switch to DOPPLER prior to pumping up the boom.

Here are one endorser's comments on the mishap described above. "The actions of the pilot, copilot and crewman reveal that the line of responsibility regarding cockpit procedures had not been established within this particular crew. The hesitancy of the copilot to inform the pilot of the deteriorating flight situation (the copilot stated that since the pilot had signed for the aircraft, the decision to abort a hazardous situation belonged to the pilot and that this area had not been covered in the preflight brief) and the incorrect ASW equipment recovery procedures indicate that these individuals had not attained a state of team training sufficient to cope with the malfunction encountered upon this flight."

Another endorser said, "This accident emphasizes the need for a thorough and complete preflight briefing covering the duties, relationships and responsibilities of all crew members when non-team individuals are scheduled together."

Prior to flight, all pilots should establish a sound line-of-responsibility between the controlling pilot and the non-controlling pilot. Emergency procedures must be briefed and both pilots must realize that in the low level night flight condition, the pilot or copilot must take immediate action when an emergency or uncomfortable situation is recognized.

*For naval aviators unaccustomed to the jargon of the ... antisubmarine business, a short glossary is offered.

Transducer—The sonar dome which is composed of a transmitting array (projector) and receiving array (hydrophone) which are joined mechanically and electrically.

Boom—A movable boom is the cable reeling machine.

Dome Seat—The transducer is fully raised and secured in the aircraft.

Drift Control—Allows manual insertion of correction signals to compensate for lateral and longitudinal aircraft drift.

Alternate approach to a hover—Approach to a hover where airspeed and nose attitude is manually controlled.

Bar alt—Automatic altitude retention sensing device in ASW mode.

Ng—Gas generator speed.

Dome Submerged Light—A light on the cockpit advisory panel that tells the pilot that the dome is in the water. It is activated by a pressure sensing switch.

Collective stick—Controls the aircraft altitude.

Pumping up the boom—Emergency backup for raising the sonar boom hydraulically.

Missing Ingredient

It has been said that coordination and teamwork generated from pilot's and copilot's confidence in each other's skill is the most essential ingredient in a successful flight team. When these essential ingredients are missing and there is a failure to use standard procedures and checklist, the end product is often such chaos and confusion that disaster is inevitable.

Another SH-3A was on a night dipping operation at 80 ft, with the cyclic coupler switch actuated to DOPPLER, when the aircraft's movements suddenly became erratic and both pilots became confused and disoriented.

Here's the pilot's description, ". . . something mysteriously turned the nose of the aircraft and we got lower and suddenly spray got up around the aircraft and we got a big halo effect. We fought there for a minute; the copilot, thinking I had vertigo or something, tried to take it and consequently two of us were on the controls and I think maybe we were fighting each other somewhat."

In the recovery attempt, the coupler was disengaged and the pilot released the controls to the copilot momentarily. When the pilot noted that rotor RPM had dropped to 90 percent and 110 percent on the torque meter, he took control again. Once more, both pilots were on the controls.

"We never could seem to get it back up off the water," concluded the pilot, "due to disorientation, chaos and confusion."

Shortly thereafter the aircraft collided with the water.

Coupler—Enables the helo to seek and retain altitudes, fore and aft speeds, and drift speeds that the pilot has programmed into the system.

Cyclic Coupler—Automatically retains the aircraft in pitch and roll axis in an ASW hover.

Collective Coupler—Automatically retains the aircraft in altitude axis in an ASW hover.

Doppler Hover—A doppler radar used to maintain a stable ASW hover.

ASE—Automatic Stabilization Equipment designed to permit hands off altitude stabilization and automatic cruise flight by introducing absolute static and dynamic stability. It enables the aircraft to automatically seek and retain selected speeds and altitudes. During the ASW mission it provides for automatic transition from forward flight to a hover over the sonar dome.

Cable angle hover—An ASW hover in which reference for the helicopter's position is taken from the sonar cable's position, e.g. when the sonar cable drifts aft the cable contacts an electronic sensing device which automatically initiates control corrections to reposition the helicopter over the cable. Similar corrections are also initiated for forward and lateral movement.

This pilot was attempting possibly the most demanding maneuver required by ASW helicopter pilots—the alternate approach to a hover. Under the existing weather conditions (light wind, slick sea, haze and no horizon), this maneuver requires the highest degree of confidence, skill *and crew coordination*.

Prior to the final dip, the pilot experienced a slight touch of vertigo—this, combined with the aircraft's erratic flight, undermined the copilot's confidence in the pilot's ability to cope with the situation.

SH-3A pilots should be aware of the characteristics peculiar to this aircraft in certain evolutions. Between 40 and 80 ft a moderate to severe vibration range occurs during the approach to a hover. During the alternate approach there may be a tendency to pitch up as the airspeed slows to 40 kts.

Moving the cyclic coupler switch to the doppler position at 80 ft was improper procedure. At this altitude doppler return is intermittent. The introduction of unreliable doppler information into the cyclic coupler probably caused erratic control movement.

In aborting the hover, the pilot depressed the bar alt release button before reaching 150 ft, causing the 150-ft reference altitude to drop out of the system. This button should not have been actuated until the aircraft actually reached 150 ft.

Excessive nose-up attitude (20 degrees or more) and use of power (torque reached 110 percent vice 80 percent and rotor RPM dipped to 90 percent) probably put the helo in rearward flight with the nose high. The resulting low rotor RPM made recovery impossible.

Analyze the Situation

When a well qualified and professional crew takes time to analyze a situation, determines what can be done and then takes the appropriate action, more often than not they will save the aircraft and possibly some lives. However, when undue haste and unplanned actions and confusion dominate the emergency situation. . .

A *Sea King's* coupler hover was suddenly interrupted by a muffled explosion, a flash of light, and a shower of sparks in the area of No. 2 engine. No. 1 engine went to max power and Ng on No. 2 engine decreased. The engine torque needles split.

With forward flight virtually impossible, the pilot directed the copilot to secure No. 2 engine, and then put the aircraft smoothly on the water.

The copilot did not respond to the pilot's order until after the water landing, and when he did react,

he secured No. 1 engine, the good engine.

Realizing that he had secured the wrong engine the copilot immediately secured the malfunctioning engine. With both engines secured, the crew had little choice other than to evacuate the aircraft. The helicopter subsequently capsized and sank.

Malfunction of the No. 2 engine was the primary cause of this accident; however, inadvertent securing of the good engine was the secondary cause and no doubt contributed to the loss of the aircraft.

Evidently a misunderstanding existed between the pilot and copilot as to which engine was to be secured.

Why the copilot inadvertently secured the wrong engine is undeterminable. However, even securing the malfunctioning engine was a bit premature. Although the engine had apparently sustained damage, it continued to run for 4-8 minutes after it had been secured. The copilot's hasty action in securing it was possibly, in part, a reaction to his original intention to secure the bad engine. When the copilot realized that he had secured the good engine and left the malfunctioning engine running, he wanted to get it shut down quickly. Afterwards he realized that had the malfunctioning engine been allowed to run, it might have helped to keep the aircraft afloat long enough to enable a salvage attempt.

Note for the next APM—pilots should be cautioned to avoid undue haste in securing a malfunctioning engine—that little bit of power may help. . . .

Precision is the password in low level operations.

Complete mutual understanding and utmost confidence are essentials in the cockpit at all times.

When the sun at sea goes down, the demands on skill go up!

Responsibilities and Procedures

While in a manual hover at 40 ft with the sonar dome lowered, the pilots of the SH-3A heard a muffled explosion and ratcheting sound emanating from above and behind the pilot's seat. As the pilot took control, the No. 1 torque meter exceeded upper limits and the No. 2 torque meter dropped.

Without attempting to jettison the practice bomb slung on the starboard rack, or going to full power, the pilot landed the aircraft on the water.

As the aircraft settled the copilot secured both engines and the pilot applied the rotor brake. A minute and a half later the aircraft turned turtle and sank.

The primary cause of this accident was material failure—the 6th stage stator vane in No. 2 engine separated and was ingested, causing compressor stalls and a power loss. Contributing was the pilot's incorrect analysis of the emergency situation. The copilot also erred in securing both engines without direction from the plane commander.

Confusion as to exactly what the malfunction was may have resulted in the pilot's failure to commence recovery procedures, which, in this case, would have been to apply full power and try to fly out of the hover.

One endorser pointed out that, "The failure of the pilot to brief the crew is considered the prime reason for the chaotic situation which ensued after the plane was in the water (i.e., the hasty and incorrect action by the copilot in securing both engines thus precluding an attempt at water taxiing to shore or single engine takeoff, and failure to release the bomb.)"

Those actions on the part of the copilot that must be immediate both in an emergency situation and a normal evolution, must be clearly defined by the pilot prior to the flight. In this case an adequate preflight brief might have saved the aircraft as the copilot would have known what to do with the engines while the pilot made the water landing and the practice bomb (that greatly aggravated the aircraft's instability on the water) would have been jettisoned.

Although it is definitely not a panacea, adoption of the crew concept can materially assist in standardization of cockpit procedures and the successful handling of emergencies. However, preflight briefing of the crew will still remain an absolute necessity.

Proper and adequate preflight briefing of the crew by the pilot prior to every flight generally results in an "all crew" awareness of potential hazards and exactly what their functions are when an emergency arises. A tacit agreement between the pilot and crew will weld together a team that can swing into action and perform flawlessly and with confidence any time. When confusion results due to a breakdown in crew coordination and confidence, the crew members either fail to rise to the occasion or act individually, often performing the wrong tasks or even conflicting tasks.

LT A. V. Safeoff Goes To a 5-Day Safety School

By CDR D.M. Layton

Lieutenant Arthur Victor Safeoff wasn't a typical Naval Aviator, but he was as typical as any other: NROTC, non-engineering background, flight training and progress through the squadron until he was close to being the "Bull Lieutenant."

Art was somewhat surprised at the conversational trend that day when the Exec called him into his office for a chat. The word 'Safety' popped up every once in a while, and although Art had nothing against Aviation Safety, he just hadn't given it much thought. Oh yes, of course, he observed the rules and he tried to keep his plane out of the trees and off the rounddown—and he stayed awake during the Safety Officer's talks at the All Pilots' Meetings—but Art had never thought of himself in the role of Safety.

"Art," the Exec said, "we've got orders on Jack Hill and we are going to need a new Safety Officer about the first of the year. The Staff has informed us that they can't furnish us a graduate of the University of Southern California Aerospace Safety Course, so we have to do a little on-the-job-training. You are the man."

Art protested that all he knew about Aviation Safety was what he read in APPROACH, but the Exec commented that with Art's knowledge of Ops, his background in squadron maintenance and his exceptional knowledge of his aircraft and its capabilities, the Skipper and the XO had considered Art to be the top prospect for the post. "The reason I'm telling you this now," the Exec continued, "is because the Naval Aviation Safety Center is holding a short course for Safety Officers the end of this month, and we want you to attend."

The quota was obtained, orders were cut, travel was arranged and on the Sunday night before the course opened, Art checked into the BOQ in Norfolk.

At 0800 Monday morning, he was in his seat in the conference room of the BOQ, looking at the handouts that included the week's schedule and talking over a cup of coffee to another lieutenant who flew the same model aircraft on the other coast.

The school started with the usual administrative remarks—turn in your orders, message board location, no-host get-together that afternoon at the Club, et cetera and then the welcoming remarks were made by the Commander, Naval Aviation Safety Center.

After the Admiral spoke, Art had an opportunity to look about the room and say 'Hello' to several old friends. One thing that amazed him was the size of the class. He had heard that there were about 20 officers in the first few classes, but this class had nearly 40. Represented were Helo, Attack, Fighter, Patrol, Transport, Utility, Regular, Reserve, Navy and Marine flyers.

The course got underway with a discussion of the duties of the Aviation Safety Officer. Art kept good notes on this inasmuch as he knew that this was to be his next job. Such things as handling of the Safety Center pubs, displaying posters, running All Pilots' Meetings on Safety and getting the other pilots to "Think Safety" were discussed.

The specific publications were discussed that afternoon by the Editor of APPROACH. Art had had no idea how the material got into these magazines and letters, but it was soon apparent that he—and all of the pilots and crewmen in his squadron—were potential contributors and authors. Art had thought that you had to be a polished writer to have an article in APPROACH and he was surprised and pleased to learn that if you had the basic background information, the professionals at NASC would smooth it into the finished product.

The remainder of the first day was devoted to maintenance problems. Here again Art paid particular attention because he had been in maintenance in the squadron and he wanted to see if these "so called experts" mentioned the accident potentials that he knew of on his airplanes. And they did—all except one problem that Art considered quite serious. When he asked about it, the speaker from the Maintenance and Material Department said that he had never heard of this problem. Art was happy when several other officers from sister squadrons said that they had the same difficulties.

"Do you consider this a Safety of Flight problem?" Art was asked.

"I surely do."

The speaker replied, "We have had no Safety of Flight messages on this subject—no official letters—not even a postcard." Then he added, "We'll look into the problem, but let me suggest if you have problems like this, you let us know, so that we can do something to help you."

Art had an opportunity to pursue this matter further after class at the informal get-together at the Breezy Point Officers' Club. He was also able to meet the entire staff of the Safety Center, many of whom he felt that he already knew from APPROACH and CROSSFEED articles.

The second day started out with the Mishap Report and the report form. After this session on Tuesday and a similar one on Wednesday, Art began to have the feeling that he could properly fill out the report if it ever were necessary. By knowing why certain information was requested and by knowing what was done with it, he felt that what had previously seemed like an unnecessarily complex form was really quite straightforward.

A supplement to the aircraft part of the report requirement was given by the Aero-Medical Department who discussed, not only the pilot section of the report, but also the Medical Officer's Report.

The remainder of the second day was devoted to accident investigation. Art was a little surprised that the investigators talked first, not about investigation, but about prevention. It was obvious though that a little prevention could replace a lot of investigation and it could also be done in more pleasant surroundings and under more pleasant circumstances.

Wednesday was more reporting and investigation information. The thoroughness with which the Investigators went into the subject caused Art to think to himself, "If I get a chance, I'm going to go to Safety School to learn more about Flight Safety." The role of the human in aircraft mishaps was also discussed the third day. This just confirmed that old saying that people are no damn good. Unfortunately, however, they are the only ones we have.

After more investigation information, including investigation from the medical point of view on Thursday, the officers from the Analysis and Research Department began their talks on operational problems, ship and shore facilities, and the mishap report from the general analysis viewpoint. This was continued on Friday with discussion of the problems encountered in specific models of aircraft.

Rescue, rescue equipment and survival techniques were also covered on Friday by the equipment specialists from Aero-Med. Art had seen much of this equipment when the class took a tour of the Safety Center spaces on Wednesday afternoon and he was quite interested in some of the particular pieces of survival hardware that he had seen at that time.

Friday afternoon was devoted to a short brainstorming session before the presentation of a certificate that proclaimed that LT Arthur V. Safeoff was a duly qualified graduate of the Naval Aviation Safety Center's Aviation Safety Officer course.

Late that afternoon, as he was flying back to the squadron, Art pondered over the week that was past. What had he learned? A lot about aviation safety, and that he really knew very little about the subject. More reading would help and perhaps more education along the lines of the course he had just completed. The Navy's long course in Aviation Safety was marked down in Art's mind as an item for the future.

What had impressed Art the most? Probably if it were to be a single item, it would be that the goal of the Naval Aviation Safety Center and indeed of the Navy's Flight Safety program was not increased reporting and improved investigation but better accident prevention in order to improve combat readiness.

The Use of Foam When...

SLIDING HOME

By CDR R.A. Wigent

It was a normal training hop for a couple of S-2 pilots who were planning to practice ADF approaches and GCAs.

About 10 miles north of the outlying facility, they decided to descend through a hole in the broken cloud layer. In order to descend quickly, the pilot lowered the gear and flaps. Once below the clouds, the gear and flaps were raised. Almost immediately the first indication of trouble was noted—a barber pole remained in the starboard wheel indicator. Wheel doors were visually checked, nothing here—they all appeared closed.

The pilot decided to drop the gear again. Port main and nosewheel locked down, but the starboard wheel wouldn't come out of its well—only the door came open.

Heading for home, both pilots checked NATOPS procedures. Attempts to pump the starboard gear down were futile.

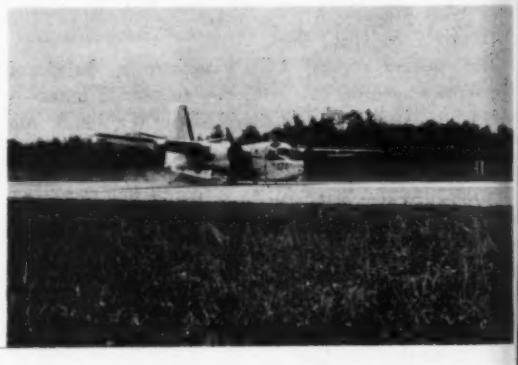
Over home plate, they informed the tower of their problem and continued attempts to get the wheel down.

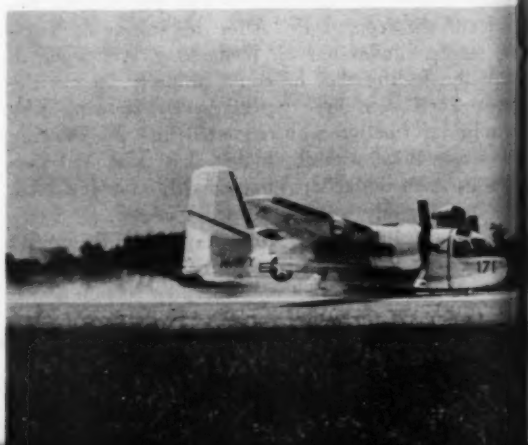
Another S-2 joined up for a visual check and reported that the shrink strut had extended inside the wheel well.

Positive and negative G, skids and more recycling were tried—nothing would dislodge the ailing starboard gear from its open wheelwell.

The two pilots decided that a wheels-up landing would be necessary. While the crash crews were laying down a 200-ft foam strip the pilots orbited overhead to burn down fuel and go over NATOPS procedures for the upcoming landing. Here's how the copilot described the subsequent landing.

"We made one low pass over the runway to observe the foam. We then came around and lined up for a normal approach, except that we extended our downwind leg to allow more time for final adjustment. Both overhead hatches were opened on final. After we were squared away on final, we cut the port engine with the mixture control—then feathered it. The emergency oil and hydraulic valves were shut





Upon touchdown the prop tore loose, aircraft ballooned and the photographer caught this unique T-28 "maneuver." Prop skipped and cartwheeled between foamed runway and plane rupturing the fuel cell. Aircraft slide ended slightly beyond foam. Crash report noted apparent value of foam as no fire ensued. Prop damage to fuel cell is shown at right.

off. I cut the port gas and turned OFF the mags.

At 200 ft, just as the end of the runway passed under the nose, we cut the starboard engine. Our airspeed was 100 kts, and we had two-thirds flaps. I tried to position the blades (by starter) so they would miss the ground, but was unable to move them. The next time I looked at them, they were in the correct position. We touched down just beyond where the foam layer began. Our glide to a stop was very smooth, with little or no swerve. Forward lurch was not detected. The cockpit filled with a thin cloud of smoke which smelled like foam."

The use of a foam strip during certain emergencies is not new—air stations have been doing this for years with very satisfying results. Some misconceptions continue to persist, however, because literature on the subject contains conflicting information. Sometimes such words as cushion of contact, blanket, reduction of decelerative forces, slippage and so on are used to describe some of the attributes of foam.

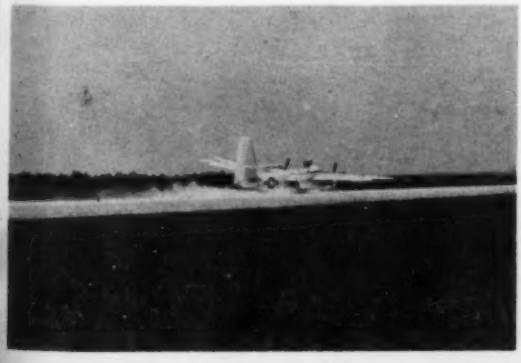
Could it be that the image of suds and its association with soap, which is slippery, is the source of our confusion? Perhaps too, the sheer volume and depth of the lather creates an impression of a soft, shock-absorbing carpet. This is just plain wishful thinking. For all practical purposes, foam is nothing more than lathered water. A pilot cannot and should not count on any of the qualities suggested above. Actually, the "slippage" that is experienced will be derived primarily from the layer of water held by the foam on the surface of the runway. In other words, a foamed runway is no more slippery than a wet runway. The coefficient of friction is the same.

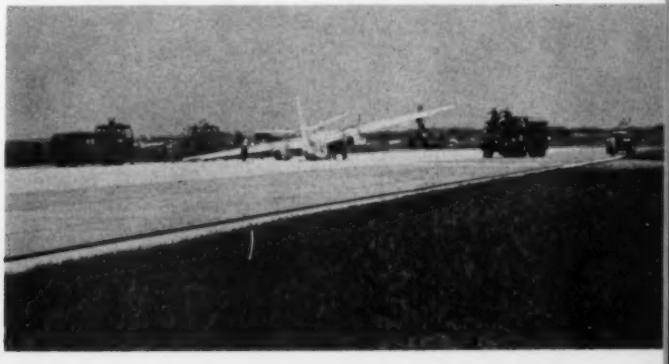
Well then, just what does foam have to offer? To pilots and advisory personnel in the tower, they should think of foam as almost exclusively *protection against fire*, both from sparking and friction generated heat. A cocked nosewheel, for example, will probably break off or the tire(s) blow regardless of whether foam is used or not. But, when the metal starts scraping on the runway, the resultant fuel-fire hazard from friction sparks will be reduced considerably by foam.

When the aircraft stops, a fuel spill hazard might exist so it's important to have the strip extended far enough down the runway to contain the entire landing run.

This, of course, prompts the question, "Just what can be expected in the way of a landing skid-out?"

A recent review of belly floppers on foam revealed the *average* slide distances depicted on page 11. While these *averages* are intentionally on the high side of the slide span, if time, equipment and aircraft fuel permit, the conservative Crash and





A-1 inadvertent wheels-up left this evidence of prop digs and scorched path. Center belly tank ignited shortly after touchdown and burned intensely throughout slide. No personnel injury although fire consumed aircraft.

Rescue Officer will want to extend the distances to better the odds of the airplane coming to a stop within the strip.

At this time, the Navy *Crash and Rescue Manual* is being revised. Included will be the preceding chart. Another source of information is the February 1960 issue of APPROACH. The information contained is still valid and considered by some commands to be the best available on the subject of foamed runways.

Well executed touchdown . . .

Aircraft slid very straight and came to rest in the foam . . .

Only "C" damage—board felt foam lessened fire chance

*Aircraft**	*Nose Gear Up*	*All Gear Up*	*Both Main Gear Up Nose Gear Down*
Light single-engine propeller aircraft (A-1, T-28)	**1500 ft**	**1500 ft**	**1500 ft**
Light twin-engine propeller aircraft (S-2)	**2500 ft**	**1700 ft*** *Conventional-geared C-45 similar.	**1700 ft**
Heavy twin-engine propeller aircraft (C-117, P-2)	**2500 ft**	**2000 ft**	**2000 ft**
Four-engine propeller aircraft (C-118, C-121, C-124)	**3000 ft**	**2500 ft**	**2500 ft**
Single and twin-engine jet aircraft (F-8, F-9, F-4, A-3 A-4, A-5)	**4500 ft*** *F-9 and A-4 only 3000 ft.	**3500 ft*** *A-4 only 2000 ft.	**3500 ft*** *Not applicable to A-4. See NATOPS.
Heavy three or four jet engine aircraft (C-135, DC-8)	**4500 ft**	**4000 ft**	**4000 ft**

*This is NOT a complete aircraft list. Models are chosen as representative examples of aircraft, size, weight and configuration. See NATOPS for details.

Another "normal" wheels-up foam landing in an A-4. Damage limited to crushed and ruptured belly tanks.

By LCDR R. W. FORD

by GUESS - or by GAGES!

Have you tried the wagon wheel approach?

Pitch, bank and power—the bywords of the USAF Instrument Pilot Instructor School—are to all aviators the familiar elements of aircraft performance.

Only the correct combination of these will put you and that iron bird where you belong, be it bombing or in the break. These are the ingredients of the USAF concept of controlled attitude instrument flight. Add a systematic cross-check, stir gently with the stick and presto—everything has turned to worms—no, not quite, but let's take a look at that menu again.

When you are cruising around VFR, a glance at the horizon and a shift of the stick takes care of your pitch and bank, while the throttle gives it the power; so too, in controlled attitude instrument flight. We adjust the aircraft attitude on the attitude indicator (gyro horizon, ADI, or other reference) and the power on the power indicator(s) (tachometer, EGT, manifold pressure, or what is peculiar to your bird). Thus the concept of control instruments, which we have decided are the attitude and power indicators.

Fine, but meanwhile what's cooking? Gaze upon the performance instruments: airspeed, altimeter, vertical velocity indicator, turn and slip, and finally HSI, RMI, mag compass or what have you. Notice we aren't flying these jewels; they are just telling us how the bird is booming along. They are the results of our attitude and power control. This implies that if we could peg in level flight the correct attitude, and power (barring external influences such as gusts and gross weight changes) nothing would change, and we could ignore the performance instruments.

So where does that leave us? It leads to the thought that by paying more attention to and making more precise changes on the attitude indicator that those performance instruments will reflect smoother aircraft control.

Now we add that systematic cross-check we have mentioned. Each pilot's cross-check is uniquely his own, but basically we are talking about the division of our attention and instrument interpretation. We have implied that in controlled attitude flight, the attitude indicator should get the lion's share of that attention, true!

The cross-check we are talking about now can be compared to a wagon wheel, inasmuch as we are establishing an attitude at the hub and glancing out a spoke to a performance instrument, back to the hub to correct that attitude with the stick. Then we glance out another spoke to check on performance again, or possibly along the rim to compare altitude and vertical velocity then back to the control instrument. So the attitude indicator is the center of the

cross-check and gets proportionately more attention.

Now what about the other control instrument, our power indicator(s)? Simple, if you haven't moved the throttle it shouldn't have changed much, and its performance indicator, the airspeed indicator, will show if any changes are needed. Before you yell "heresy" in deference to our old friend angle of attack, let's face it, this system relegates you and me to the position of a *manual* auto throttle, or if you have one, turn it on.

We have talked of *what* we are doing, now let's see *how*.

Here we begin to approach that by-guess part, but fortunately with a few techniques it becomes an *educated* guess. Any time the performance instruments indicate you are deviating from your desired flight path you must make an attitude change on the attitude indicator. This is a matter of direction and magnitude. The direction, left, right, up or down, is normally pretty clear. The magnitude—how about a thumb rule or two?

Try this one for pitch—a one degree pitch change will result in a vertical velocity equal to your mach number X 1000. So if you are doing .7 MN, a one-degree pitch change will give you 700 fpm descent (or climb) and a 1½-degree pitch change will produce 1000 fpm.

Many horizon bars are two degrees wide (you will have to check your own), so to get that 1000 fpm we are only talking about a ¾-bar-width change.

This is where precision replaces the guesswork in the system. For example, if you decided you want to correct back to your altitude by a vertical velocity in fpm that is twice the amount you are off in ft (i.e., 300 ft low requires 600 fpm climb correction) and your vertical velocity is not zero (for example, 800 fpm descent), then you want one pitch change to correct both (i.e., 600 + 800 = 1400 fpm nose-up pitch change, which will be two degrees or one bar-width change on the attitude indicator at .7 mach no.). This is a small but effective correction. It also demonstrates the need for pegging your attitude with trim and determination so that you will have a base attitude from which to make precise changes.

Notice that *this system automatically corrects what might be supposed its greatest weakness*—induced gyro precession. Any existing precession is reflected by the performance instruments, and the specific correction required is applied directly back on the attitude gyro.

As for bank, try these thumb rules.

Use the same number degrees of bank as degrees of heading change desired, up to 30 degrees of bank (which is used for any turns of greater than 30 degrees).

As a guide for a standard rate turn, the degrees of bank are 1/10 of your TAS plus six (SRT Bank angle $= \frac{\text{TAS} + 6}{10}$).

Or for a half standard rate turn, divide TAS by 20 and add six ($\frac{1}{2}$ SRT Bank angle $= \frac{\text{TAS} + 6}{20}$).

Now all you have to do is roll in on the control instrument the number of degrees you have decided upon, and then cross-check the performance instruments, the turn needle and heading indicator. Feel like an adding machine, or ready to go back to "one potato, two potato"?

Try this technique the next time you hit the GCA glide slope with a brisk headwind or heavier than normal gross weight (i.e., fast). As a guide on a 3-degree glide slope your desired rate of descent in fpm will be ½ your ground speed times 10, so if you are going to indicate 135 kts and they have given you a 15-kt headwind, try a 600 fpm descent $(135—15 \times 10 = 600)$.

If your destination has a 2.5 degree glide slope use 100 fpm less, in this case 500 fpm. Hardly the accuracy of integral calculus, but then when you are bumping along in the soup, you'll probably settle for anything that will get you on that glide slope in the right direction—down.

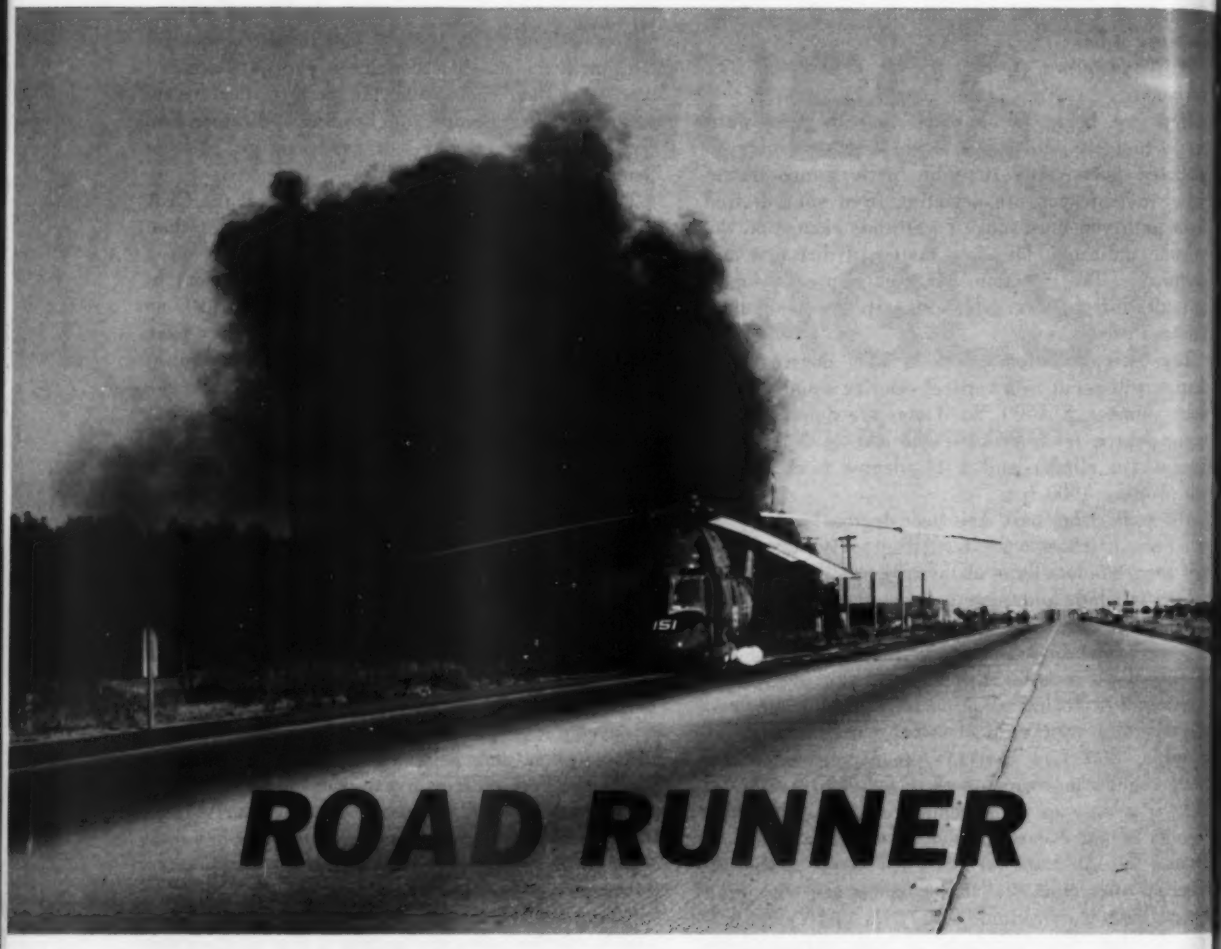
All this has been pretty basic, but then most pilots agree that instrument flight is just a matter of various combinations of climbs, turns, descents that are interspersed with hours of stark straight and level.

These thumb rules were intended for instructors to develop an appreciation for the effectiveness of various pitch and bank changes. Once you have gotten the feel of it you can stop worrying about all the adding and subtracting, keep those pitch changes down to parts of a bar width, and give the vertical velocity a chance to react. The noteworthy feature of the system—it works.

So the next time you boom off into the black, and soup is on the menu, try adding a few of these tidbits to your old recipe—stir gently with the stick, and presto—oh well—there is that old familiar out —"this *!?;!?*!*?;! gyro is precessing."

LCDR R. W. Ford is a Navy exchange pilot assigned to the USAF Instrument Pilot Instructor School, Randolph AFB, Texas. Since August 1964 he has been training USAF instrument instructors in the T-38 *Talon*. These TAC and ADC pilots normally return to their squadrons to serve as instrument check pilots and standardization board personnel. Prior to his present duty he flew the A-4 in VA-76 and attended the U. S. Naval Postgraduate School, Monterey, California.

Successful helo takeoffs at remote sites may require the skills of a surveyor and diplomat as well as good pilot technique, particularly in situations where man-made obstacles and spectators abound.



ROAD RUNNER

TRUTH and CONSEQUENCES

About 1400 on a hot Saturday afternoon the Lieutenant's phone rang. It was the station duty officer, calling to ask that he fly an investigating team out to the scene of an accident involving an ordnance-loaded Navy contract truck. The truck driver had lost control, left the road and struck a warehouse. His vehicle then exploded and burned.

Half hour later the pilot arrived at base operations,

got a brief and filed a local flight plan. While preflighting his UH-2B he determined that additional fuel was needed. Rather than fill up, he had only 1050 lbs put aboard, thus allowing himself an 800-lb margin to compensate for the crew, passengers, temperature and density altitude.

At 1550 he was ready to go. In his words, here's what took place during the next 22 minutes. "I eased the helo into a hover and noticed it required max T-5 (677°). After takeoff I reduced power to maintain 600° and recycled the landing gear to insure that the previous day's gripe on the landing gear had been taken care of. The gear checked satisfactorily so I proceeded to the accident scene. Enroute I began wondering about my landing area, remembering that it took max T-5 to hover during takeoff.

"I arrived overhead the accident scene about 1605 and flew northbound along the highway until I was satisfied that all southbound traffic was being diverted, and after reversing course, it became obvious that the same was being done to northbound traffic.

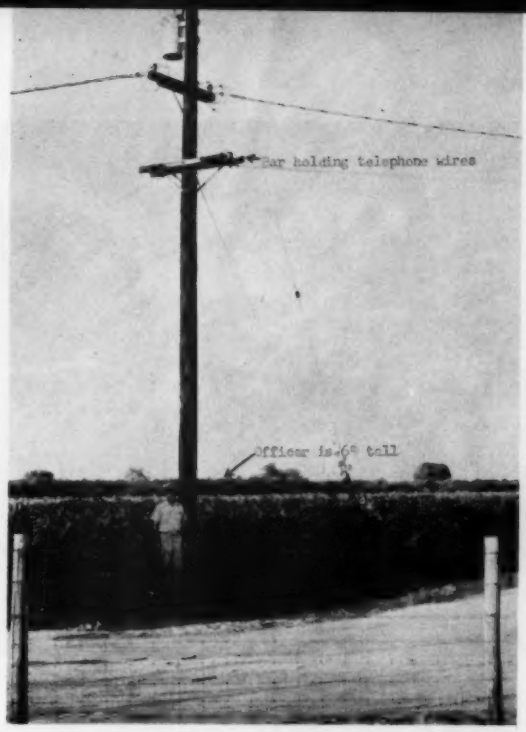
"I then descended to 200 ft AGL and began looking for a suitable landing area on the closed highway. After orbiting the area I selected a landing site that was clear of obstructions. I decided not to jettison fuel as it would make a difference of only 200 lbs. A normal run-on-landing could easily be made.

"Landing was into the wind and normal in all respects. After about a 200-foot rollout the aircraft was stopped with mild braking. The gear pins were inserted and the rotor system shut down. I noted the time at 1612 and jotted it down on my kneeboard as the investigation team exited the aircraft."

While waiting for the investigators to return the pilot scouted the area for a suitable takeoff zone. The route he had used to land looked safest, but complications had since arisen. Curious spectators were closing the area on foot. One bomb had not been accounted for, and several spectators had walked up behind the helo, using it as a shield in the event of additional explosions. To complicate matters further, a car would occasionally get past the roadblock and drive up close behind the helo before being turned back by the highway patrol.

The area to the left of the helo, across the freeway, had power lines along it, and many motorists were stopped along the access road on that side also.

The area to the right of the helo was blocked by a peach orchard and a large crane that was busily engaged in tearing a building apart . . . searching for the missing bomb.

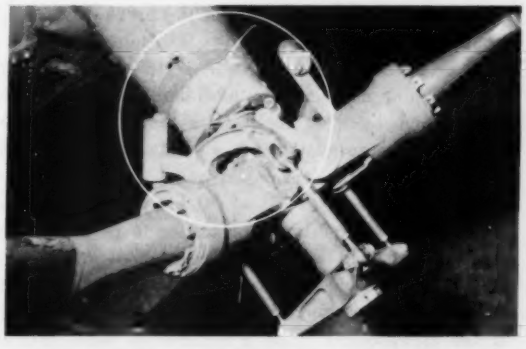


Phone lines were not observed during survey of takeoff path.

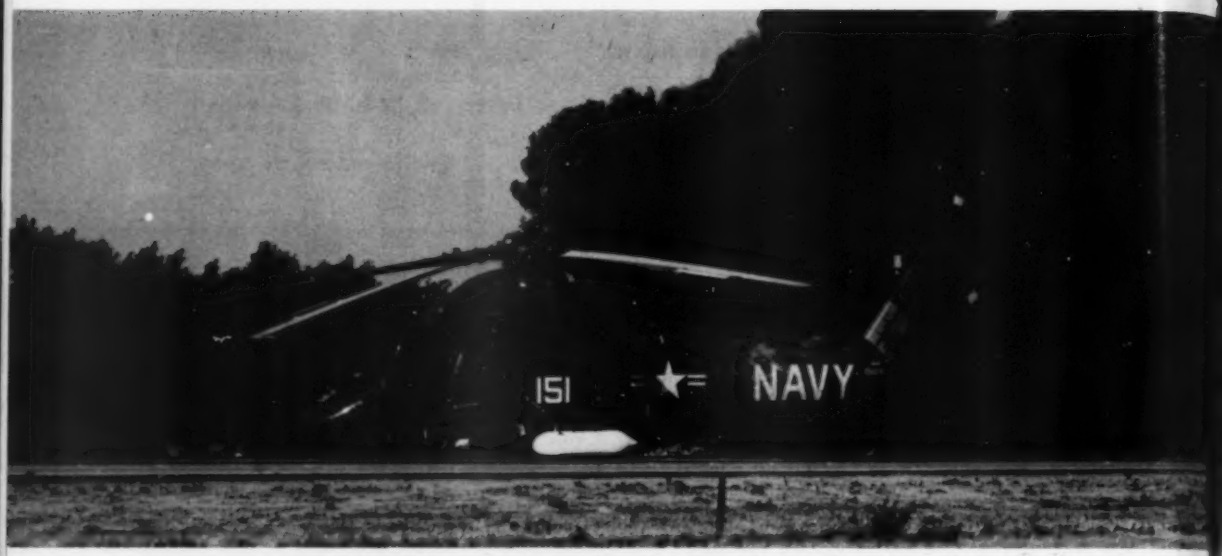
Straight ahead now seemed to be the best way out, even though a high tension line was strung across the freeway about 200 yards ahead of the spot where the helo was parked. At best, it seemed the least undesirable of the possible alternatives.

The investigation team returned in about 30 minutes, after completing a rather hurried tour of the area. Each of them seemed anxious (understandably) to leave the area as soon as possible.

Everyone loaded up but the pilot couldn't engage his rotors immediately for fear of hitting some spectators who were still crowding around the rear of his aircraft. He had a crewman shoo them back far



Severed telephone line entangled tail rotor.



Fuel from ruptured starboard aux fuel tank ignited as helo slid to a stop.

enough to ensure safe rotor engagement.

After rotor engagement, normal pretakeoff checks were satisfactorily completed. Gear pins were pulled, and with everyone aboard the pilot lifted off into a hover. Outside temperature was 101°. Even with a 10-kt wind on the nose, maximum T-5 was required to hover.

At this point the pilot decided to air taxi beneath the high-tension lines that lay ahead on his exit route. These were his reasons behind the decision.

- Concern for the safety of the people behind him
- Probability of an engine overtemp if he turned downwind
- Attempted departure to the left or right seemed unsatisfactory because of spectators on the one hand and obstructions on the other
- Desire to take advantage of the prevailing wind, because of the density altitude

While easing ahead into the glare of the setting sun the pilot managed, with difficulty, to keep the high-tension lines in sight. His visibility problem was further aggravated by a dusty, bug-spattered windscreen.

Airspeed was in excess of 20 kts as the helo approached the power lines. Clearance to pass beneath them still seemed adequate so the pilot raised his gear and prepared to make a left-climbing turn once beyond the wires and the spectators on the left side of the freeway.

Suddenly a new set of wires (telephone lines) appeared at 12 o'clock—slightly above cockpit level! The pilot lowered collective immediately and used forward cyclic with a rapid reversal of controls to avoid crashing into the pavement nose first. A moderate jar was felt when the telephone lines were severed. Cyclic control immediately became erratic and the helo developed a severe one-per-one revolution.

The pilot set it down, gear up, tail wheel first and lowered the collective to make a positive straight ahead slide. He shut down the engine and applied full rotor brake as the helo slid about 200 ft on its aux fuel tanks.

When it stopped, the rotors were still turning at about 70 percent; the passengers and crew started jumping out through the starboard cargo hatch. Seeing that the rotors were coming dangerously close to their heads, the pilot yelled for them to stand clear. Apparently they didn't hear, so he applied full back cyclic and up collective to keep the rotors as high as possible. In a few seconds rotor RPM had decayed to about 30 percent and the rotor brake was taking full effect.

The right aux fuel tank had ignited while the helo was sliding to a stop, and by the time the pilot was ready to exit, the fire had almost engulfed the right side of the aircraft. He held his breath and jumped clear, receiving only mild "suntan" type burns on small areas of his neck and right arm.

A fire truck arrived about four minutes later but the center section of the aircraft had already been

consumed. After the fire was extinguished, examination revealed a four-foot piece of telephone wire wrapped around the tail rotor, and a piece of similar length wrapped around one of the flaps.

Conclusions

According to the Accident Board, a more extensive survey of the planned takeoff path might have disclosed the low-hanging telephone wires and thus prevented this mishap.

The pilot was definitely distracted by the cluster of spectators near his plane while he was preparing to depart. When ready to engage the rotor, he was obliged to wait and have his observer move these people back to a safe distance. After liftoff, he flew the airplane up the highway a considerable distance rather than fly over the spectators. These distractions undoubtedly divided his attention, to the detriment of his survey of the takeoff course.

A second contributing cause factor was the existing temperature/aircraft gross weight combination. Due to the ambient temperature of 101° and aircraft weight, a vertical liftoff was not considered. The low air taxi into the wind was the best method of takeoff considering the circumstances.

Fire fighting efforts were prompt but too late to save aircraft.

The reduced visibility from within the cockpit also contributed. This resulted from the sun's rays, which were beaming directly into the cockpit, and the cluttered windscreen, which had picked up some dust and bugs on the trip up.

In the absence of fire, which was triggered by a small amount of fuel in the flight aux tank, the wheels-up landing would have resulted in very light aircraft damage. The pilot's decision to land the vibrating, partly out-of-control airplane wheels-up as soon as possible was considered correct. Since he was the only pilot aboard, an attempt to get the gear down might have precipitated complete loss of control.

Recommendations

The Accident Board recommended that two qualified pilots be aboard whenever it becomes necessary to dispatch a dual-control helicopter to other than normal helicopter landing areas.

One endorser pointed out that the pilot and his crew did not use to the maximum "the on-site assistance of local police." Continuing, he stated that "since the pilot had previously demonstrated that he had room for a rolling landing, a more prudent approach to a successful takeoff would have been to request the police to clear the area of spectators, position the airplane back down the highway prior to start, and utilize a rolling takeoff to fly over the power lines."

In closing, he pointed out that "The setting sun, high ambient temperatures, and the congestion created by the crowd of onlookers certainly contributed to 'stacking the deck' against the pilot and his decision to act as he did."

This type of mission may be routine in helicopter operations, but it does present several unique problems.

In the typical air station environment the pilot is provided with a protected area to land, park, shutdown, start engines, taxi and takeoff.

At a remote site he must see to these matters himself, often while dealing with persons and circumstances not subject to his direct jurisdiction or control.

Under such conditions, it is understandable that the burden can sometimes become too great for one pilot to handle. It is a credit to the skill, ingenuity and perseverance of the pilots involved that such missions usually come off without a hitch. This was the exception.

HOW DID IT HAPPEN?

From the damage given in these Incident Reports, can you guess what happened?

1. A-3—Aft radio compartment speed brake open line fitting broken; both utility hydraulic pumps need replacement; extensive wiring and hydraulic line damage in the ADU compartment; low portion of the nose gear landing strut bent; both main mount tires blown.

2. P-2—Antenna under fuselage broken off; starboard bomb-bay door, elevator trim tabs, and MAD cone require replacement.

3. A-4—No aircraft damage. Two 300-gallon tanks damaged. No damage to private property.

4. A-4—Right and left main landing gear door scratched and dented; right and left wing slat dented and torn; right and left wing leading edge inboard of slat dented and torn; UHF antenna torn off; small dent in nose of center-line drop tank.

5. A-3—Some of the items in the forward port side of the bomb bay requiring replacement: Surface control reservoir, hydraulic filter case, main landing gear down line, hydraulic pressure line to bomb-bay doors, landing gear emergency air lines. The aft ADU compartment bulkhead requires a small patch where the above mentioned hydraulic lines are routed through.

6. T-28—Propeller tips ground off approximately ½ inch.

7. A-4—Dents and scratches on port external fuel tank from forward end to four feet aft on port side. Tank indented up to two inches.

WHA' HOPPEN (The Details)

1. An A-3 was scheduled for a cargo/mail flight from a carrier to shore. Due to an imminent recovery, a rapid respot of the deck necessitated an accelerated launch of the A-3. The normal 30-minute period from "man aircraft" to launch was reduced considerably (when flight crew reached the flight deck the aircraft was being towed into position on the catapult and the crew was advised to man the aircraft immediately).

In addition to the mail that was placed on the cargo rack in the bomb bay, an unknown individual placed two additional bags of mail in the port aft section of the radio compartment. On the catapult shot, these two bags moved aft, striking and shearing the open side of the speed brake hydraulic actuating cylinder line.

The main gear retracted but a complete hydraulic failure occurred prior to retraction of the nose wheel. It was decided to continue to the beach with the nose wheel down and locked.

Upon arrival overhead the air

station, burn-down to Morest weight was commenced. The main gear was blown down without difficulty but the flaps bled back to the full-up position after initially going to full down. Light rain had begun to fall as the pilot commenced his approach.

Touchdown was about 155 kts. The drogue chute was immediately deployed and braking commenced. Prior discussion with the tower had made the pilot aware of the Morest speed and weight limitations, and since the aircraft approached the pendant in excess of 120 kts, he decided not to take the gear. He felt that braking action plus the abort chain gear would be sufficient to permit a stop on the runway.

When abeam the Morest the nose wheel shimmy-dampener failed due to lack of hydraulic fluid, a violent vibration commenced, brakes were applied, both main mounts blew and directional control was lost. The aircraft drifted to the right and came to a stop with the starboard main mount off the runway.

2. While respotting a P-2 on the flight line, the tractor operator disconnected the tow bar from tractor to reposition the tractor. The aircraft rolled backward off the inclined parking ramp 75 ft into dense underbrush and foliage.

Cause was listed as "inexperienced men in cockpit and improper supervision." The battery switch was OFF, main and emergency hydraulic pressure was down. No brake pressure was available. No chocks were near the aircraft.

3. Pilot of an A-4 experienced utility hydraulic system failure on a test flight. He inadvertently pulled the EMER BOMB handle rather than the EMER LDG GR handle.

Pilot error and lack of recent blindfold cockpit check-out were considered the primary causes. Cockpit design was considered a contributing cause in that all of the emergency handles have the same shape and are located generally in line across the lower instrument panel.

Recommendations: (1) that a blindfold cockpit check be performed quarterly in conjunction with the ejection seat dry run and that stress be placed on the emergency handles, (2) that the feasibility of incorporating shaped handles be studied; e.g. a wheel-shaped handle for emergency gear release.

4. On a low-level navigation training mission, an A-4 pilot descended below minimum authorized altitude. He was consulting his chart and felt a soft thump. The aircraft performed normally so without informing the chase pilot the pilot continued the mission and landed without further incident.

The soft thump resulted when the aircraft struck a tree. At the time of the incident, the chase pilot was at 1000 ft, also orienting himself on his chart and did not see the situation developing.

5. An A-3 took off from a shore station enroute to a carrier. A cargo load of 1700 pounds was carried in the bomb bay. The aircraft made a normal arrested landing and the mass of the cargo broke loose, hurtled forward and damaged the forward bomb-bay area.

The cargo rack did not have the usual restraining lip on all four sides which was commonly used in the command. The cargo itself was not properly packaged in adequate containers (fire bricks packed in cardboard boxes and 98-pound bilge pumps). The ¼-inch manila line was not of sufficient strength to restrain the cargo during arrestment.

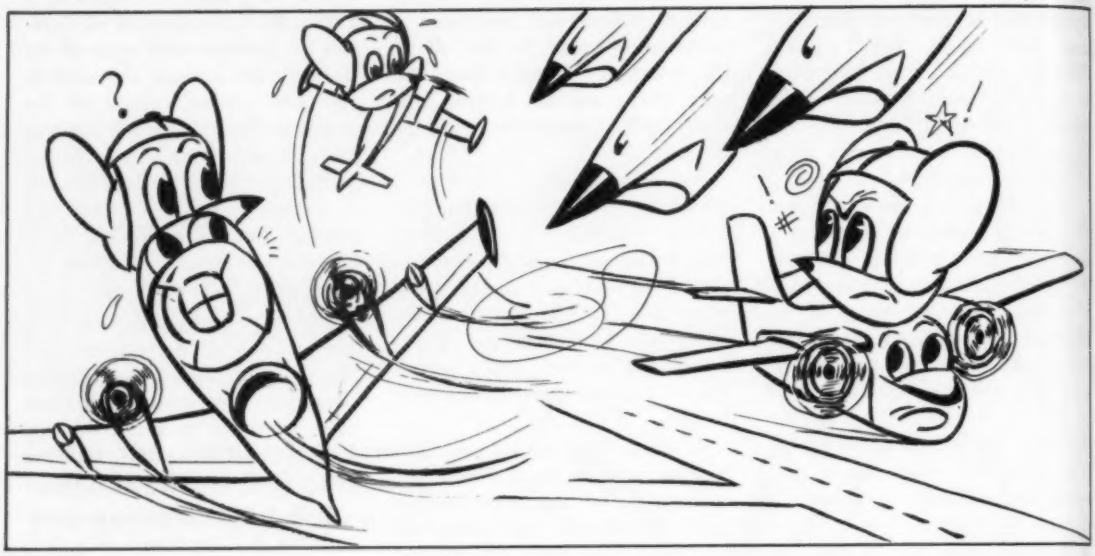
6. During night taxi, pilot of a T-28 used the wrong set of flarepots for guidance and went off the taxiway. He stopped the aircraft and told ground control of the situation. The crash truck was sent out and one of the men gave the pilot taxi signals to come ahead. Power was added to 30 inches and although the aircraft did not move forward, the nose dipped and the prop hit a concrete drain.

Failure to shut the engine down after taxiing off the taxiway was listed as the cause. Contributing cause was the attempt by crash crew personnel to bring the aircraft back on the taxiway utilizing power from aircraft.

7. Pursuant to routine maintenance, an A-4 was towed to a clear corner of the flight line in order to perform an engine run-up. The aircraft was chocked under both main mounts but was not tied down because there were no pad eyes in the area. An NC-10 was positioned in front of the port wing to provide electrical starting power.

After the aircraft was started, the pilot allowed it to idle, then advanced the throttle in 10 percent increments to 85 percent. Due to the discomfort of holding full brakes with the seat pan and parachute removed from the aircraft, the pilot was holding only partial brakes. The aircraft jumped the chocks and the pilot immediately applied full brakes and reduced power. Before it skidded to a stop, the aircraft hit the NC-10 with the port external fuel tank.

Three factors were involved: (1) aircraft turned up to a high power setting without being tied down, (2) the NC-10 was positioned five feet in front of the port wing and was not moved away after the aircraft was started, (3) pilot conducting the turnup was holding partial brakes.



Disoriented Approach

Three F-8s were descending toward home plate after an uneventful hop. The weather was 3000 scattered and 10,000 overcast with numerous thunderstorms in the area and reduced visibility.

During the descent the flight leader, a senior type with over 3000 hours, violated a local AFB climb corridor, and then after reaching 1000 ft, headed towards our entry point.

We passed one mile ahead and 500 ft below a P-2 as we crossed the beach. The flight leader continued his descent down to 800 ft. to avoid clouds, but became trapped and wrapped into a 60-degree bank upon penetrating the clouds. As No. 3 man, I was forced to bank 80 degrees to stay in loose parade.

We emerged and passed within 50 ft of the P-2. The flight leader stated later that he did not see the P-2 until it was called to him. We then, in roughly this order, violated a local municipal airport's control zone, missed a *Stoof* by some 100 ft, (it was in a landing pattern for a local NAS, so we also violated this control zone). The visibility in and out of clouds was extremely low by this time as we passed within 200 ft of a twin engine *Cessna*. To avoid a large cloud bank the leader wrapped it up into a 60-degree right turn while at about 500 ft.

I was at 275 ft by this time, after the last near miss, and heading directly for another *Stoof*. It may have been the same one we missed earlier. If so, I'm sure he considered turning in his wings after being "attacked" twice in four minutes. I pushed over (gently) to 100 ft indicated and passed under him. I then broke off from the flight, contacted approach control while maintaining VFR, and got a GCA to home plate.

Later the flight leader apologized, claiming he was disoriented. He thought he was approaching the field from the ocean side vice the bay side, although his tacan was working 4.0. His flight was glad to have lived to tell about it.

ANYMOUSE

The purpose of Anymouse (anonymous) Reports is to help prevent or overcome dangerous situations. They are submitted by Naval and Marine Corps aviation personnel who have had hazardous or unsafe aviation experiences. As the name indicates these reports need not be signed. Self-mailing forms for writing Anymouse Reports are available in readyrooms and line shacks. All reports are considered for appropriate action.

—REPORT AN INCIDENT, PREVENT AN ACCIDENT—

Divert Scramble

The carrier was operating 80 miles off the coast, preparing for the last recovery, on one of those nights when everything seemed to go wrong.

Aircraft were being assigned approach frequencies for IFR descents through a maze of cumulus build-ups. Below, a VFR pattern was established around the ship and the first jets crossed the ramp while the horizon was still pink.

Two F-8s and two A-4s got aboard and then a combination of darkness, closing weather, pitching deck and low fuel states called for a bingo.

"All jets, your signal is Bingo, pigeons 285 degrees, 85 miles."

Four A-4s which had already separated in the pattern proceeded individually while two F-8s broke off their descent to rendezvous with an A-4 tanker, which was already enroute to the beach.

The fuel states of all diverting aircraft were below 1300 pounds but since the bingo field was clear and nearby, it looked like a no-sweat situation.

The ship had received (by message) information indicating that the divert field, a newly completed Air Force Base, would be completely operational 24 hours a day.

This information was incorrect, however, because all navaids, runway lights and radios at the field were secured promptly at 1800 to lessen the load on its temperary generator.

The diverting pilots tried tower frequency and Guard with no success.

A nearby field was alerted and two A-4s diverted and landed there.

The pilot of a third A-4 was unsure of the second field's location and decided to remain in the area of the closed field, which he was able to identify with the aid of lighted ships just off the beach and starlight reflections on the sandy runway.

Meanwhile, the two F-8s had been unsuccessful in obtaining fuel from the A-4 tanker while inbound.

Each had made several practice plug-ins but the tanker's store wouldn't transfer.

The three aircraft crossed the beach 20 miles south of the (closed) divert field and turned north while descending at idle power.

One F-8 was now down to 300 pounds of fuel, while the other F-8 was indicating only 100 pounds.

About this time the fourth A-4, with less than 50 pounds of fuel remaining, declared on guard that he was shooting a precautionary flameout approach to the closed runway.

He touched down on a big "X" and secured his engine, expecting to run into ditches or construction equipment. He made it without mishap, however, and braked to a stop.

Encouraged by the first pilot's success, the other three low-state pilots headed for the darkened runway. Except for the option of ejecting, they actually had no other choice at this point. While approaching the runway, one of the F-8 pilots announced he was down to 50 pounds and might have to eject.

As the A-4 reached the 90-degree position, the two F-8s passed him on straight-in approaches.

All three aircraft touched down at about five-second intervals.

The F-8s rolled out on the left and center of the 100-foot-wide runway, and the A-4 braked to taxi speed in about 3500 ft. From this point, he could see the other A-4 pilot (who had landed initially) frantically waving his lighted cigarette lighter (Good head!) behind his darkened aircraft.

Fuel remaining in the four aircraft on the runway totalled 350 pounds.

By now the base had sounded GQ, and all available vehicles were being rushed to the runway to illuminate it with their headlights.

Meanwhile, the A-4 tanker pilot was circling overhead, watching the flail. He landed about 15 minutes later.

The Air Force was most hospitable, despite their lack of facilities at this time of night. The debrief included cold beer, which helped somewhat in calming everyone's shattered nerves.

To say that these pilots were handed a can of worms would be an understatement, but they stayed with the problem and fortunately came out on top, smelling like the proverbial rose.

A lot of luck and some mighty good head work helped make this scramble wind up on the happy side.

Reader Questions Headmouse Answers

Have you a question? Send it to Headmouse, U. S. Naval Aviation Safety Center, Norfolk, Virginia 23511. He'll do his best to get you and other readers the answer.

Difference in Navy and Air Force Stop Signal

Dear Headmouse:

We recently experienced two near serious taxi incidents in which conflict of interservice aircraft handling signals was considered to be a contributing factor. Both cases involved transient USAF aircraft whose pilots failed to execute the emergency stop signal given them by a Navy taxi director.

USAF signals conform to the International Civil Aviation Organization (ICAO) signals as do the majority of the Navy's signals but the all important stop/emergency stop signal does not. Our Safety Council members feel that the standardization of this signal throughout the services is a must and that the ICAO signal should be adopted by the Navy.

Your comments will be appreciated.

W. V. LUCIC, LCDR
ASO, NEW ORLEANS

▶ Adoption of the Air Force/ICAO stop signal is not considered desirable for Navy usage because of the arm movement involved. Movement of the arms could be interpreted as a come-ahead signal during night carrier operations. Naval night taxi signals must be compatible with carrier environment of high winds over deck, minimum light, exceedingly close quarters with multiple aircraft in precise taxi movements occurring simultaneously with frequent stops and come-ahead signals. Under such conditions each signal must be unique and cannot lead to misinterpretation. The Navy's stop signal is a distinctive positioning of the hands (policeman's stop or crossed wands) without further movement of the arms. Because the Air Force stop signal does not lend itself to Navy adoption it is felt that this is a matter of educating the troops in this particular difference. Air Force authorities are being informed of this situation, and for the benefit of Navy types, the difference is published here.

Very resp'y,

Headmouse

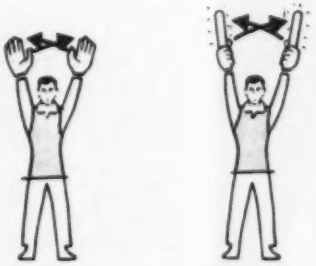
Wait for the Thaw?

Dear Headmouse:

We are concerned about de-icing arresting gear chains and associated equipment during cold weather operations. Several methods have been tried without success. It has been suggested that a flamethrower might be a suitable ice combatant. Do you have any ideas on this problem or perhaps know what apparatus and methods are being used by other stations with a similar problem?

ICE HOUSE MOUSE

▶ NavWeps 51-5-28, "Operation, Maintenance and Overhaul Instructions for Field Emergency



AF: Stop
Arms repeatedly crossed above head (the rapidity of the arm movement should be related to the urgency of the stop, i.e., the faster the movement the quicker the stop.)—AFR 60-11

Navy: Stop
Raise both hands to eye level, palms to pilot, in policeman's "stop."
—NWP 41(A)

Emergency Stop
Day—Cross forearms overhead with fists clenched.
Night—Cross signaling Wands.—NWP 41(A)

Arresting Gear, E-5 and E-5 Model (Chain Gear)" states: "It is sometimes necessary, when the field is located in snow-covered zones during winter months, to remove the equipment from the field and stow for a period of time." The Enroute Supplement indicates this is the practice for some fields. The use of a flamethrower for de-icing the gear is not consistent with the maintenance instructions contained in NavWeps 51-5-28 and therefore considered not a satisfactory solution to the problem. Deviations from these instructions should be referred to BuWeps for approval. The use of de-icer fluid is preferred and may be warranted in some cases.

Very resp'y,

Headmouse

Desert Solar Still

Dear Headmouse:

I read an item about a simple solar still in a scientific newsletter recently. It sounds good. Do you have any information on this?

THIRSTYMOUSE

▶ This emergency still was devised by two scientists at the U. S. Water Conservation Laboratory, Dept. of Agriculture, Tempe, Ariz. It involves digging a hole in the ground, preferably in the sunshine, placing a container at the bottom, filling the sides with fleshy plant material such as cactus, and spreading and anchoring a sheet of plastic film over it with a rock to weight the plastic down over the container. Moisture from the plants condenses on the underside of the plastic and runs down into the container.

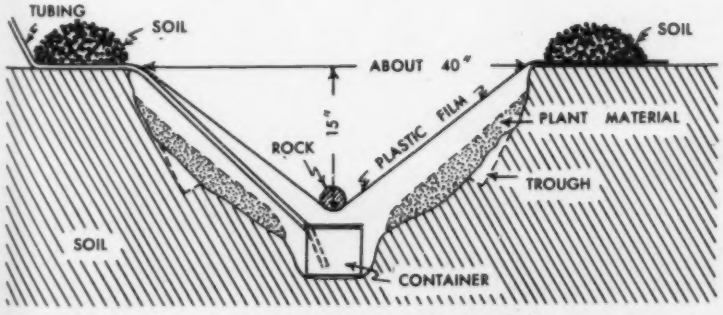
Under good conditions, one pint of water can be expected in six hours. Three pints of water a day can be obtained from a still constructed in a damp, clay soil. While three pints a day may not be enough to enable a person to survive indefinitely, it will prolong survival and increase chances of being alive when found.

From a dry desert soil, the yield may be ½ pint or less a day. To keep from having to disturb the still every time you want a drink, a plastic tube routed from the container, up under the anchored plastic to the outside can serve as a "straw."

The Safety Center reprinted the complete report of the WCL scientists in the September 1965 *Personal/Survival Equipment Crossfeed* and the September 1965 *Flight Surgeon's Newsletter*.

Very resp'y,

Headmouse



Unlike the flight control systems on present day high performance aircraft—the Naval Aviation Safety Center desires a continued feedback.

Has information in any Safety Center publication ever helped you to prevent an accident, avert an injury, or deal with an emergency in a better way?

If so, and you have not already informed the Safety Center, it is particularly desired and important that you do so. Such feedback is vital to all departments at the Center and for fiscal support of our safety research and education program.

Rescue Reports

Dear Headmouse:

What are the requirements for submitting a rescue report? Are these reports required in "non-helicopter" rescues?

BLACKSHOE MOUSE

▶ Yes, a rescue report is required in a "non-helicopter" rescue. OpNavInst P3750.6E states:

- *Requirement*: A rescue report (OpNav Form 3750-13) will be submitted whenever a rescue is attempted of personnel involved in a Navy aircraft mishap, or whenever a Navy aircraft is involved in rescue attempt.
- *Originator*: The reporting custodian (or appointing authority) submitting the mishap report is responsible for either obtaining the information from the rescuing activity or having the rescuing activity submit the report. If no aircraft mishap is involved the reporting custodian of the rescue aircraft is responsible for submitting the report.
- *Time Limits*: The rescue report will be submitted within five working days of the rescue or attempted rescue.

Very resp'y,

Headmouse

BAILOUT

The afternoon hop from carrier to shore had no special mission attached to it. On the way the two A-3Bs were to practice low level navigation.

Cat launch was normal—the only problem arising as the flight leader left the deck was a partial intercom failure. The crew could understand each other if they yelled. Seventy-five miles out, the UHF and VHF went out and the ICS became completely unusable. The leader rocked his wings and the wingman came up alongside. The leader indicated his radios were out and the lead was passed to the wingman.

As the wingman came alongside to take the lead, he saw fuel leaking from the leader's starboard pylon and signalled this information to him. Corrective measures failed to stop the leak and as the flight was approaching the halfway point, a single engine landing ashore seemed preferable to one aboard ship.

As the aircraft climbed through 2000/3000 ft, the starboard engine caught fire. Fuel dump was begun. As the plane continued to climb, the pilot yelled, "Prepare to bail out!"

The fire increased in intensity. Fuel was soon streaming at the leading edge of the wing from fuselage to wing tip. Part of the wing tore off. The pilot signaled for the emergency escape hatch to be blown and gave the order to bail out. At an altitude somewhere between 3500 and 4500 ft, 280 to 300 kts IAS, the four crewmembers left the aircraft in quick succession—crewman/navigator, passenger (an ATR3), bombardier/navigator, and last of all, the pilot. The aircraft went into a port bank, descended and crashed into the sea.

Four parachutes were sighted by the crew of the second A-3B which climbed immediately to transmit a Mayday signal and to direct SAR aircraft and vessels to the scene.

Wave height was 15 ft with a 15 to 20-kt wind. Air temperature was 76°, water temperature 75°. Before nightfall three survivors had been sighted by

search aircraft. They were subsequently rescued by surface vessels—the pilot and passenger by an MSTS ship and the bombardier/navigator by an Italian vessel. Extensive air and surface search failed to locate the fourth man.

The survivors' narratives in this accident are of particular interest because of the recent installation of parachute deflation pockets on three out of four of the parachutes used and because of the survivors' water landing difficulties. The Naval Aerospace Recovery Facility, El Centro (NARF) has studied the case in detail. Although there was no record of the location of the parachutes in the aircraft, NARF is of the opinion that the pilot had the one unmodified parachute. A further point of interest in this case is that the squadron involved was wearing the MK-3C life preserver with the NB-8 parachute.

Now back to the accident itself as the crew prepared to bail out . . .

Passenger's Story

When it became apparent that bailout might become necessary, the crewman/navigator began to review pre-bailout procedures with the passenger.

"I listened to him closely," the passenger recalls, "but I didn't really think it would happen to me. Things like that are only supposed to happen to other people!

"Just prior to bailout, our ICS system seemed to come back on but it was very garbled. I looked out my window again and saw a printed message being held up in the window of the other plane: 'BAIL OUT!' Almost at the same instant, the crewman turned to me and yelled the same thing. I still couldn't believe it, but ripped my cords and oxygen hose off. I don't remember seeing the crewman blow the hatch down, but as I undid my seat belt I saw him slide out. As fast as I could move, I pulled myself up and slid out the hatch."

The passenger's parachute opened automatically just as he began to search for the D-ring. He tried to sit back in the parachute harness sling during descent but he couldn't. He undid the chest strap of his harness and left the leg straps attached.[1]

"I looked down and watched the water 'coming up' at me. As I hit, I crossed my arms to protect my face. Throughout the entire bailout, I failed to put my helmet visor down. I didn't realize this until someone aboard the carrier asked me about it later. When I hit the water, I brought my arms down and unfastened the leg straps. Something was wrong because I still wasn't free of the parachute as I had expected to be. The chute was open on the surface of the water and was dragging me.

"As I was being dragged along," he continues, "something kept bouncing against my back. It was the chute back pack slinging on the surface of the

water almost like a sled. I grabbed it and managed to turn on my left side. I swung around it, trying to find the fouled line. I was lucky enough to find the trouble almost at once. It was my raft lanyard that somehow had flipped between my legs and attached itself to a shroudline.[2] After I unfastened the raft line, it slid from around my leg and I was free. I inflated my life vest."[3]

The passenger, now free of his parachute and with his life preserver inflated, decided to take off his flight deck shoes and helmet. He didn't remember anyone telling him not to and thought this would improve his buoyancy.[4]

After about 10 minutes, he saw his parachute canopy floating some distance away and swam to it. Although he was concerned about tangling in the

[1] Unless the survivor has been able to sit back in the sling, this procedure is dangerous. It could result in his entering the water upside down hanging by the leg straps, or even in falling out of the parachute harness.

[2] If he had been wearing a Mk-2 life vest, correct procedure would have been to route the raft lanyard under the right strap and snap it to the Mk-2. While wearing the Mk-3C he could have done the same thing, snapping the lanyard to his person or around the life preserver fastening at the front of the preserver.

[3] Recommended procedure for pilots and crewmen wearing the Mk-3C and torso harness is life preserver inflation during parachute descent. Here, of course, the Mk-3C was worn with the standard NB-8 parachute harness. Though there are no

'My raft lanyard had flipped between my legs and became attached to a shroudline.'

shroudlines, he tried to get more air under the canopy to help keep the sunken seat pack afloat. After several tries, he raised the equipment container to the surface and disengaged the snap holding the raft in place. He pulled the CO_2 cartridge lanyard and the inflated raft popped out. Boarding the raft was easy but five minutes later he was dumped as it capsized. The equipment container had sunk again, putting tension on the lanyard to the raft. Thinking the lanyard was responsible for his troubles, he cut it. Only later did he remember the survival equipment in the container.[5] He reboarded the raft.

SAR planes were soon in the area and the passenger was located. He had no .38 or pencil flare gun and did not know that there were day/night distress signal flares in his Mk-3C. The only thing he used to signal his position was his 2-cell flashlight. He was picked up by an MSTS ships after being in the water 5½ hours.

Bombardier/Navigator's Story

"Parachute opening shock was normal," the bombardier/navigator states. "My straps were loose from turning and watching the starboard engine and I did not have time to tighten them or to hook up my raft lanyard before bailout."

His parachute harness sling had slid too far up behind his back for him to get into it. When still about 1000 ft above the water, he undid his left leg quick ejector fitting. He didn't slide down in the harness any so at 300 to 400 ft he undid his right strap. He crossed his arms, placed his left hand on the chest fitting, and opened it just before water entry. When he threw up his arms, the wind pulled the harness and seat pack over his head along with his helmet. (He does not remember tightening his helmet chinstrap either before bailing out or during parachute descent.) Free of his parachute, he now inflated his Mk-3C life preserver.

"I was very comfortable in the water as long as I kept my back to the waves," he reported. "After a few minutes I saw my parachute a little upwind to the west. I swam to it but decided that I did not want to chance getting entangled just for a one-man life raft."

Shortly afterwards, aircraft began to appear. The wingman was circling to the east and an S-2 was orbiting over the area in which the bombardier/navigator estimated two of the parachutes had descended into the water. He fired several tracers.

rules to cover this combination at present, it would seem better to get rid of the parachute and harness before inflating the Mk-3C to make it easier to locate and release the leg quick ejector fittings.

[4] NavWeps 00-80T-56, the *Survival Training Guide* says leave your shoes and clothing on.

[5] He should have pulled the equipment container into the raft with him immediately.

'I was pretty chilled and didn't see how I could make the raft before it got dark.'

About 2¾ hours after water entry, he attracted the attention of a multi-engine aircraft with his tracers and strobe light.

"He saw me, made a low pass, circled and dropped a 7-man life raft 100 yards away. I swam toward it for about a half-hour but never got much closer than 60 to 70 yards. I had almost given up getting to the raft and was mentally preparing myself for an all-night stay in the water. I was pretty chilled and didn't see how I could make the raft before it got dark.

"About this time I saw a buoy about 10 yards to my left and swam to it. It was three or four ft long and circular with parachute fittings and rope leading to the raft. I followed the rope until I came to the raft. It was impossible for me to just climb in—the sides were about 1½ ft high above the water line. I took hold of a rope attached to the side and went around to the other side and tried to pull myself aboard. I couldn't. Finally I took off my Mk-3C, threw it into the raft and pulled myself aboard easily by means of the rope."

Once in the raft, the bombardier/navigator tried to put his Mk-3C on again but says he was unsuccessful. (His report does not elaborate on this statement.) He left the life preserver in the bottom of the raft while he broke out his own survival gear. This included a pencil flare gun with seven flares, a whistle, two day/night distress signals and a .38 loaded with tracers.

During the next hour and a half, when he saw lights in the area he fired tracers and the seven flares from his pencil flare gun. Three of the flares failed to fire. Whenever he saw planes or ships' lights, he turned on his strobe light. Between 2045 and 2100 he saw a ship heading in his direction and fired tracers, held his strobe light above his head and blew his whistle.

"The ship had me in sight and moved within shouting distance. I could hear the crew talking but couldn't understand them since they were Italian. They stayed close for a couple of minutes, then backed off about a quarter of a mile. About a half hour later they moved in again but at a different angle. . . . As they came closer, I yelled at them and could see they had put a whaleboat in the water."

The whaleboat crew threw the survivor a line; he pulled the raft up to the whaleboat and was taken aboard. He had been in the water about five hours.

"In summary," he stated, "at no time was I in any serious difficulty. I was not afraid and I did not panic. I was sure that I would be rescued by morning. There are a lot of factors that helped in my survival—the wingman's timely Mayday and position reporting, the rescue aircraft's dropping the life raft before dark, and the skill of the crew of the Italian rescue ship that picked me up. I am grateful to all personnel involved who helped save my life. . . ."

Pilot's Story

The pilot was the last to bail out of the burning A-3B.

During parachute descent he, too, was unable to get back into the parachute harness sling and because of this, decided not to unfasten the leg quick release fittings during descent. He did connect the life raft lanyard to his survival vest.

At 100 to 150 ft above the water, he released his left leg fitting, then positioned his hands on the chest fitting and the right leg fitting. On water entry he pulled hard on both. The chest fitting opened but the right leg fitting did not. He inflated his Mk-3C life preserver.

As the parachute billowed in the wind, it started moving through the water.

"I grabbed the risers that were at the bottom of the parachute and started pulling them towards me, partially collapsing the chute. I thought, 'Well, it's starting to collapse now so I'll go ahead and try to undo my other leg strap.'[6]

"While I was trying to loosen the other leg strap, the wind caught the chute again and it started to tow me. The wind was between 15 and 20 kts with gusts up to possibly 25. There was a brief lull in which I was able to work back up and try to free the strap once more but I could not get it undone. Another gust caught the canopy, jerked me and started

[6] Pulling the lines "furtherest from the water" to collapse the parachute in this situation is recommended by the *Parachute Manual*, NavWeps 13-5-501.

the chute moving out again at a high rate of speed.

"At about this time, the strap slid down my leg and caught on my right foot. From this period on, I was pretty much at the chute's mercy. By maintaining a position either on my stomach with my head facing aft from the chute or on my left side, I could breathe pretty well. I wasn't really too worried unless a big gust caught me and I was under the water from a half minute to a minute. I was hoping, of course, that the wind would subside or that maybe the water would catch the chute and that I would have a chance to undo it.

"I feel that I was pulled for possibly 20 to 30 minutes. I can say that it was one hell of a ride! It was a great strain on my legs, especially my left one which was at 90 degrees to the right leg in all three directions much of the time. I'm surprised that it wasn't pulled out of joint.

"Finally, either the wind died off quickly or the chute caught in enough water to collapse it. I was able to work my way up to my foot and release it. Then I grabbed the seat pack. The chute by this time was actually starting to sink. I tried to open the latch that holds the raft and the survival kit inside the pack but by this time I was exhausted and had swallowed quite a bit of sea water. I could not budge the latch and the chute was sinking—I was holding the seat pack up pretty much by myself now. I felt extremely weak and wasn't sure that I could continue to work with the pack. I worked with it for approximately 10 minutes, then abandoned it as the Mk-3C was functioning quite well."

During the next two hours, the pilot expended 13 of his 14 rounds of tracer ammunition and used both day/night distress signal flares from his Mk-3C. He attempted to fire seven flares from his pencil flare gun. However, the flares, which had been issued just before deployment, were not the right size for his gun. His last night distress signal attracted the attention of a SAR plane. The crew dropped several marker flares around the pilot's position but then seemed to lose him.

"And so," the pilot recalls, "I bobbled along merrily on my way."

Meanwhile, his flares plus his survival strobe light had attracted the attention of an MSTS ship which picked him up at about 2030. He had been in the water 4½ hours.

Continued

'After being pulled for possibly 20 or 30 minutes, I can say it was one hell of a ride!'

The Naval Aerospace Recovery Facility thinks that the pilot had the parachute without Clothing & Survival Equipment Change 5, Revision A, (deflation pockets) because: 1) He was dragged for 20 to 30 minutes. 2) The parachute started to sink very shortly after the canopy collapsed whereas canopies with deflation pockets installed usually trap pockets of air under the canopy as it deflates and, because of this, remain afloat for some time.

The bombardier/navigator and passenger had parachute assemblies with canopy deflation pockets installed and the pockets functioned effectively, NARF theorizes. This thinking is based on the facts that: 1) Both parachutes were within sight of the survivor after collapse. If deflation pockets had not been installed and had not functioned effectively, the parachute, with only the weight of the container, harness, and survival kit acting, would have been blown out of sight of the crewmember in a very short time. 2) The parachute canopy remained afloat for 10 minutes and longer which is characteristic of the deflation action which traps air pockets under the wet canopy as the bottom pocket anchors itself in the water and the wind blows the rest of the canopy down on top of the uneven water surface.

"The crewman/navigator's parachute also had the canopy deflation pockets installed," NARF believes. "If, as the accident investigation board noted, he was incapacitated as he exited the aircraft, there would be a reasonable explanation for his disappearance. The canopy would deflate within 10 seconds after he impacted the water and remain afloat for a considerable length of time. However, without some signaling device, the floating canopy and man would be very difficult to locate with six to eight foot swells and white caps. Past experience has proven that the floating, inverted canopy looks very much like a white cap."

Although the investigating flight surgeon noted many equipment and procedural difficulties in the survival phase, he praised the performance of the crew during actual escape phase.

"Once the emergency had materialized," he says, "the crew responded smoothly and efficiently in bailing out of their burning aircraft."

The most significant factor in the survival of three out of the four crewmembers, in his opinion, was the presence of the second A-3B which broadcast an alert and remained in the area. The burning A-3B with its inoperative radios was unable to make its position known.

The confidence of the survivors that they would be rescued was an important consideration although the flight surgeon remarks that they were perhaps a bit overconfident. Because of this, they let important survival gear slip away from them. Fortunately, rescue efforts went as anticipated.

"Had the weather hampered the rescue operation for even 24 hours, the survivors would have been severely restricted," the flight surgeon concludes.

As it was, the Rescue Report speaks of the difficulty of seeing the survivors in the water even during the daylight hours. "This was primarily caused by the sea state and the fact that only one survivor was able to man his raft," the report stated. "Darkness did hamper the rescue effort but signaling devices such as tracers, lights and flares were very effective in locating survivors."

AAR Recommendations

All of the Aircraft Accident Investigation Board's recommendations in the personnel area and one recommendation in the aircraft area dealt with survival. The Board recommended that:

- All flight personnel know the contents of their survival pack thoroughly.
- A revolver with tracer ammunition, a strobe light and a whistle be provided to all flight personnel.
- Passengers should be equipped the same as regular crewmembers and thus be afforded the same survival opportunity.
- Survivors should always be prepared for an extended survival period and all survivors should make every effort to retain all of their survival equipment.[7]
- Personnel make sure that all parachute release fittings work freely and enter gripes on the yellow sheet.

Later Developments

The squadron concerned has received Area Commander approval to evaluate the NB-7 parachute equipment with Koch quick release fittings in the A-3B.

"Besides providing a simple positive means of releasing the parachute canopy," an endorser to the AAR writes, "use of the NB-7 will require the crewmember to wear a torso harness, thereby permitting him to use the Mk-3C life preserver as designed. This evaluation will be completed as soon as possible."

Subsequent BuWeps action authorized the squadron to modify aircraft to accommodate the NB-7 parachute.

[7] All three survivors were without helmets when rescued. The rescues involved climbing a rope ladder or being hoisted by life ring and lanyard up the side of the rescue ships. In such situations, the helmet can be a great protection.

HIGH in the sky

The following is excerpted from an FAA Notice of Proposed Rule Making on the consumption of alcoholic beverages in general aviation.

"The ability of a crew member to perform without impairment of his flight judgment, coordination, and reaction time is an essential element in the safety of flight in air commerce, and in the effectiveness of air traffic systems in the handling of increasing volume of air traffic. The possible effect of alcohol consumption by a crew member upon his performance is a matter of serious concern to the Agency. It is also a matter of the most serious concern to the flying public sharing the airspace with the drinker as well as to persons and property on the ground.

"Accident investigation has indicated that alcohol in reasonable probability has been a factor in a significant number of *general* aviation fatal aircraft accidents. (*General aviation is all aviation other than air carrier for hire, the government, or the military.—Ed.*)* According to data on general aviation flying in 1963, the toxicological analysis of tissues from the 158 pilots in command who were fatally injured in aircraft accidents who were subjected to autopsies showed a measurable blood alcohol in 56, or 35 percent of these autopsied cases. In 1964, the like analysis as to 195 pilots in command shows that there was a measurable blood level alcohol in 78, or 40 percent of those autopsied cases. In approximately 10 percent of these cases alcohol levels were so high as to indicate an advanced state of drunkenness.

"Even small amounts of alcohol affect judgment, coordination, performance, and reaction time. There is a measurable deterioration in automobile driving with as little as 30 milligrams of alcohol per 100 cc of blood. Flying an airplane is a more complex operation than driving an automobile. . . .

"If an airman ascends to even a moderate altitude with alcohol in his blood, the effect of the alcohol would be compounded. For example, the physiological effect of alcohol is twice as great at 10,000 ft as compared to its effect at sea level. . . .

"The harmful effects of alcohol continue after the alcohol itself has left the blood. Even when the severity does not reach hangover status, the aftereffects include decrease in alertness and thinking ability, a reduction of motor skills, and a loss of coordination. In fact, after drinking a modest amount of alcohol there is a feeling of fatigue and drowsiness as much as 10 to 12 hours afterward, long after the alcohol has left the blood stream but still exerting an effect upon brain tissue. . . ."

—FSF Accident Prevention Bulletin 65-8

*There seems to exist some disagreement among agencies as to the true figures and what they mean. The CAB's report BOS-5-4-5 states, "A statistical review of General Aviation Accidents, 1963" indicates there were a total of 482 fatal accidents in General Aviation in 1963, and (on page 26) that there were 37 fatal accidents due to pilot intoxication." But no matter the differences of opinion, one fact remains—alcohol and gasoline do not mix. A few drops may not make a drink, but then there's no such thing as being "a little bit pregnant" either. And there is nothing in medical literature to prove that oxygen inhalation will cure a hangover! *—FSF Comment*

Short Snorts

The more you hear about safety the less you hear about accidents

High Honkers

Although the following report by LCDR Tom Covill, Aviation Safety Officer at NAS Glenview was submitted about this time last year, the bird migratory season is upon us again.

We were in a P-2 enroute from Quonset to Glenview via V880 at 12,000 ft. Flight conditions were VFR, with a solid undercast at 10,000 ft. In the vicinity of Windsor, Ontario, Cleveland Center reported a flock of birds at one o'clock. Initially it was assumed the birds were much lower and beneath the cloud deck. To our surprise, after scanning the area several minutes, about 150 Canadian geese were spotted above the clouds and about 100 ft below us.

How these birds could navigate above a solid cloud deck at that altitude was considered quite unusual. They were heading south and going along real strong VFR. *For more information on bird migratory paths see FAA publication AIM, in NAS flight planning rooms.—Ed.*

Soft Spot

The bright glare of a 2-inch mantle of snow presented quite a contrast to the dark gloom inside the hangar as the *Stoof* was towed out for a morning preflight. The snow had fallen the previous evening . . . on Christmas day.

. . . gear dropped into snow-covered ditch.

As the airplane was being positioned on the ramp, the starboard gear settled into an unseen sand-filled ditch (See photo above).

Public Works had dug the ditch two weeks earlier to repair a broken water line, then refilled it with sand until weather conditions were suitable for properly resurfacing the entire area.

Suitable barricades/illumination had not been placed to warn that the surface was unsafe for aircraft ground handling operations. Thus a fundamental safety precaution was overlooked.

The petty officer in charge of the towing operation was aware of the unprepared surface prior to the previous evening's snow fall. He had forgotten about it.

Faulty Wire

The EC-121P had been airborne 2.5 hours on a local flight.

During a range approach the No. 3 generator overheat light began to flicker and then came on steady for four minutes.

Breaking off the approach, the PC began to climb to 6000 ft and feathered No. 3 on the way up. The overheat light went out immediately.

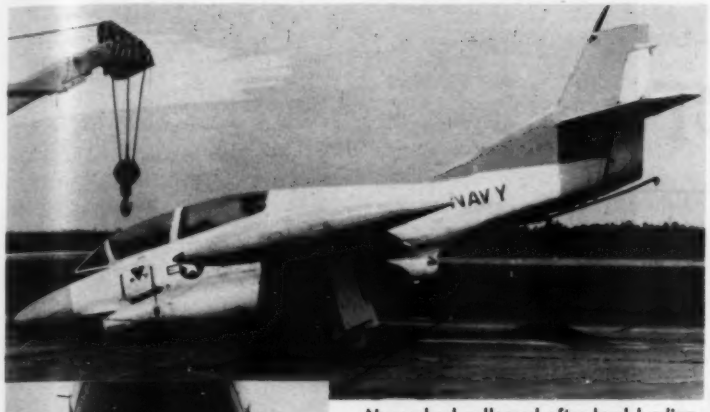
Postflight inspectors discovered that a wire running to the overtemp bulb had shorted to ground. This short seemed to be verified by the flickering of the light prior to coming on steady and the abruptness with which it extinguished upon feather . . . long before an overheated generator could have had sufficient time to cool.

The generator checked out satisfactorily on turnup under a load and the faulty wire was replaced.

Hard Landing

The setup didn't look exactly right to the LSO, so he gave the *Buckeye* pilot a waveoff on short final.

Perhaps the student pilot was concentrating so intensely on the landing area that he actually did not see or hear the waveoff signal.



Nose wheel collapsed after hard landing.

Whatever the reason, he continued the approach and completed his touch-and-go landing.

Touchdown was extremely hard, racking up nearly 9Gs on the airplane.

The pilot continued his hop, completing two more touch-and-go landings before making a final.

As he taxied back to the ramp area the nose wheel gear collapsed forward and the aircraft skidded to a stop. Damage included a bent nose gear actuating cylinder and a broken downlock.

Landing Signal Officers should require pilots to make a final after observing a known or suspected hard landing, and have the airplane thoroughly inspected before permitting it to continue in the bounce pattern.

ZAP

An Air Weather Service Accident Prevention Council meeting recently reported that "a series of lightning strike incidents have occurred in the last three months. Damage has generally been confined to the normal lightning strike areas, i.e., radomes, antennas, rotating beacons, and control surfaces. (One aircraft experienced a lightning strike through a pylon tank which ignited the residual fuel.)

"These lightning strikes occurred at various altitudes *but all were within a temperature range of 0° to minus 10°C.* This temperature spread correlates with AWS Technical Report 179 which states that 90 percent of all recorded lightning strikes have occurred within this temperature range." It might be well worthwhile to take a peek at the temperature at your proposed flight level if thunderstorms are along your route.

Plane Guard

Plane guard flights may become a bit routine at times, but here is a tale about one that livened up somewhat about 30 minutes after takeoff.

The air was punctuated with two loud explosions which occurred as the UH-34J hovered at 200 ft about 300 yards off the starboard quarter. The engine stopped abruptly.

After starting autorotation the pilot put the mixture in RICH. Several seconds later the engine caught and he headed toward the carrier. Just as he came over the deck the chip detector light illuminated. At touchdown the engine stopped again. Suspected cause of engine malfunction is wrist pin failure in the No. 7 cylinder.

The pilot is commended for handling this emergency situation in an outstanding manner. *Well done, HT-8.*

The Brush-Off Season

Have you had to sweep any snow off wings lately? If that white stuff that is in season now brushes off easily and no ice deposits remain, you can put away the glycol solution. Put it anywhere but on the wings or other aircraft surfaces.

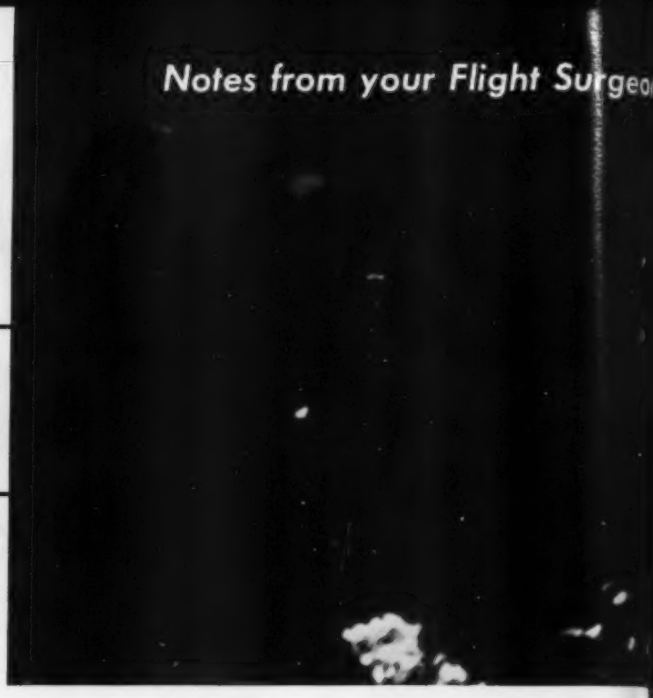
If the temperature is below freezing, if the aircraft has been cold-soaked, and a dry snow is falling, glycol on the surfaces will cause snow to build up, and you'll really be stuck with a de-icing job. But if your expert examination shows snow is sticking to the skin of the plane, go ahead and use glycol.

—Adapted from FSF Bulletin

Hi-Viz Tape

There are still a few pilots and crewmembers flying without hi-visibility tape on their helmets. Remember that hi-viz tape is just another precaution which might *save your life.* Many pilots have been rescued at night simply because of this tape's reflective capabilities. If you are one of those who are not so-equipped, take your helmet to the parachute loft and *get it up-to-date now.*

Dunker Training Payoff



MENTAL flashback to Dilbert Dunker training in preflight days helped an SH-3A copilot escape from a sinking, inverted helicopter, he reported after the accident.

"The left side of the nose hit the water first. The time from thump to impact was 15 seconds. I reached for the cockpit escape handle but I do not know whether I found it or not. The next instant we rolled left and water entered the cockpit very rapidly. I was upside down, still strapped in and submerged with the impression that we were sinking straight to the bottom. My mind then flashed back to the Dilbert Dunker at preflight. I released the seat belt and shoulder straps and popped up inside the helo facing aft about six feet from the escape hatch on the port side. The hatch was open and water was pouring in like through a dam gate. The helo had about a foot and a half of air still in it. I approached the hatch which had about six inches of daylight showing, ducked under and pulled myself out. . . ."

When rescued he was in a state of mild shock.

The flight surgeon investigating the accident recommends "development and ready availability of a simulated SH-3A ditching trainer similar in nature to the venerable Dilbert Dunker to provide realistic impact and underwater escape situations."

He also recommends procurement of "a satisfactory method of spontaneous illumination of all emergency escape hatches in a helo crash at sea.

"The value of such a method of illumination during a night egress in a sinking and/or disoriented aircraft would be immeasurable," he says. "Possibilities might include luminous tape or paint and impact-activated or salt water-activated lights."

Training

THE pilot owes his life (in large part) to proper and adequate training. One month before the accident, his squadron engaged in survival activities in which they were dropped in the water and trained with survival gear. His nearly automatic behavior during the egress after ditching allowed him to escape the aircraft even in his stunned and dazed state.

—Flight Surgeon in MOR

Loose Cylinder

AFTER a helicopter ditching, a crewmember had the benefit of only one of the CO_2 cylinders in his Mk-2 life vest.

In preflighting his survival equipment, he had failed to discover that one CO_2 cylinder was loose in its container. When he pulled the cylinder toggle, the bayonet could not puncture the cylinder because the loose cap allowed it to move.

All pilots and crewmembers wearing the Mk-2 life vest should carefully preflight their CO_2 cylinder container caps for tightness to make sure that the CO_2 cylinders are firmly seated. If the life vest doesn't inflate when the toggles are pulled, it can be inflated orally.

O_2 Preflight

AT 37,000 ft while on 100 percent oxygen, a TF-9J pilot experienced symptoms of hypoxia. He first realized his trouble when he had difficulty in controlling the aircraft. Shift to normal oxygen and to safety pressure did not improve the situation. Actuation of the bailout bottle alleviated his symptoms, allowing a safe landing at home base. Investigation revealed that the flexible corrugated tubing was split near the console end in the front cockpit.

Careful maintenance and preflight of the oxygen system is vital.

Dress Rehearsal

THE pilot's procedures during ejection and parachute descent were all in accordance with NATOPS. His actions in the water and during the helicopter pickup indicated a very high state of training and preparedness. The proper use of the survival equipment available to him greatly expedited his rescue. *He had attended a briefing two days earlier by the same helicopter rescue crew that rescued him.*

—From an AAR

Dividends

PILOTS and crewmen must become more conscientious about the survival techniques and equipment. . . It is mandatory that each man take time and study his equipment and consult with the parachute rigger, safety officer, and flight surgeon when necessary. I feel that unfamiliarity and an attitude of "it can't happen to me" can contribute to difficulties in egress and survival after an accident.

Bailout and ditching drills should involve actuation of survival equipment. The extra time spent by parachute riggers in this area will pay dividends in terms of lives saved.

—Flight surgeon in MOR

"Wolf! Wolf!"

AN NAS tower records at least two false emergency locator beacon actuations each week, according to the report of an Area Task Committee. These signals from the PRC-49 and the PRT-3 have caused many unnecessary SAR alerts. Eventually a feeling of complacency toward the beacons will result. The committee asked anyone who knowingly triggers a beacon to notify Base Operations so they will know it is not an ejection.

Fatigue

THE fatigue of a shorthanded catapult crew working long hours during an Operational Readiness Inspection was implicated in the loss of an S-2D over the side after catapult launch. Primary cause of the accident was failure to properly seat the tension bar in the holdback fitting. The S-2D crew escaped unharmed.

Investigators found that the catapult holdback man had had only one hour of sleep in the 30 hours preceding the accident and that the safety man had had five hours. Both men stated that at the time of the accident they were very tired. The holdback man says he worries about injuring his hands when he is tired. The safety man feels muscle fatigue in his legs.

"I could be almost positive this aircraft was hooked properly—unless my eyes were playing tricks on me because of lack of sleep," the safety man told investigators. The holdback man's comment was almost identical.

"The tension of the ORI may have also affected the performance of these two men," the investigating flight surgeon reports. "It is noted that on the first attempt they missed the hook-up and the aircraft had to be pushed back into position for this to be accomplished. They knew that they were being graded on how smoothly, efficiently and expeditiously their launch sequences were being handled. It is perfectly logical that a repetitious and routine maneuver, such as placing a tension bar in a holdback fitting, might have been performed incorrectly under the above adverse circumstances."

The aircraft accident board's No. 1 recommendation: "Key flight deck personnel involved with flight safety should be afforded sufficient rest to meet individual needs."

"I am appropriately shook up and damn glad to have gotten out, down and back in such remarkably fine condition."

—A-4 Pilot after Ejection

Troubleshooting the T56

By G. E. Davis, Flight Test Engineering, Lockheed California Co.

Through years of design refinements, the T56 turboprops on the P-3 *Orion* have acquired the polished sophistication demanded for efficiency and reliability without introducing complexity into the cockpit.

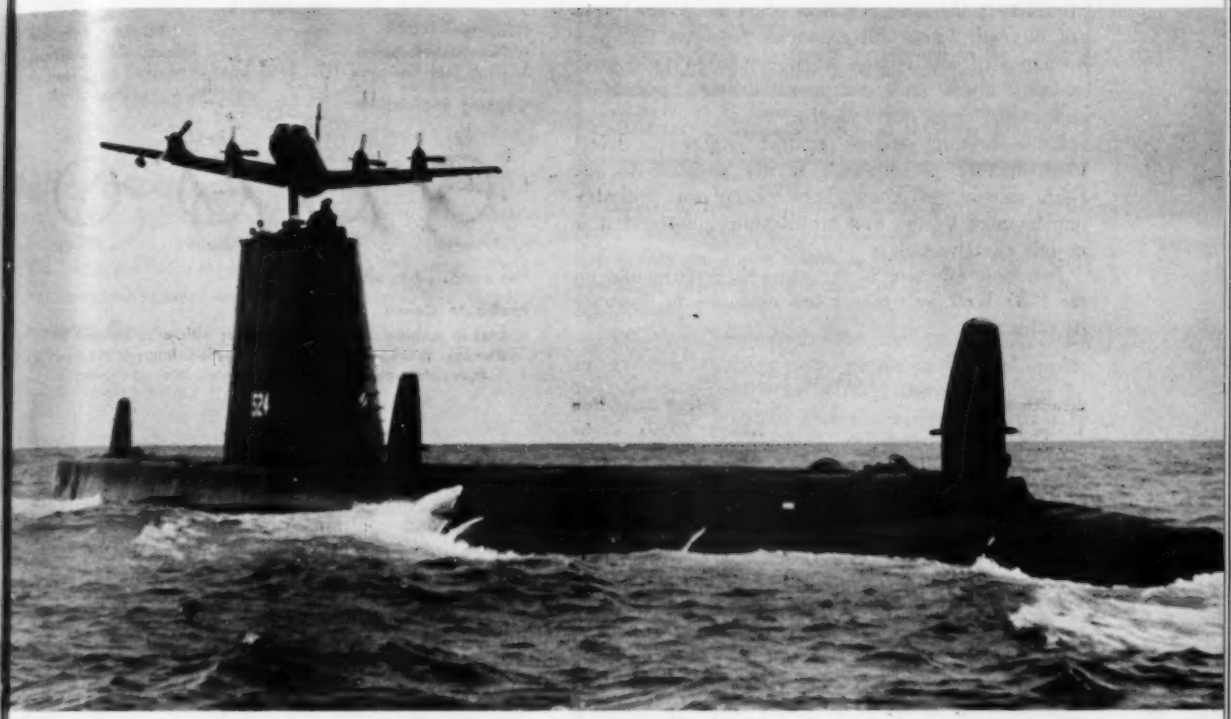
Normally the pilot has only to push a control lever forward and over 3500 horsepower is at his fingertips, which, when delivered to the prop develops some 8000 pounds of thrust for the airplane. However, these engines, being machines of mortal man working in a harsh environment, cannot be entirely immunized against every ill, and the occasional failure or malfunction will occur. If a problem occurs in flight, the crew must draw on their experience and knowledge of emergency procedures, and act with alacrity if damage to the engine is to be minimized. Once the emergency is over however, the crew has a further responsibility—less dramatic but highly important—for they alone can recount the events on the yellow sheet to guide and direct intelligent maintenance action.

A few of the questions which maintenance will want answered are: Were there any unusual indications prior to the failure? What were the engine instrument readings prior to shutdown? How long did the engine operate after trouble became apparent? What do you think caused the failure? These are reasonable questions, but not always easy to answer.

For illustration purposes let's take an example of what can happen when insufficient data is recorded during flight. Suppose a south-bound sea gull intercepts one of your north-bound engine air inlets. Needless to say, the seagull is never going to be the same, but what of the engine? Based on tests, the engine will suffer a small loss in power and a reduction in fuel flow due to compressor blockage. The engine will probably surge momentarily and if it's an inboard engine, the EDC/air conditioning system may give some malodorous evidence that gulls are not fastidious in their choice of food.

Let us assume the engine was not immediately secured since the crew were curious to learn how seagulls affect performance. After observing the engine for a period they noted that after the initial power loss, the engine continued to operate normally at the lower power level, and although no further problems developed, they prudently secured the engine and returned to home base.

Of course the engine would be inspected after landing and some large bird components would still be in the inlet. There would probably be no apparent compressor damage, but as a precautionary measure the manufacturer would be notified of the occurrence.



T56-equipped P-3 *(Orion)* on station during ASW exercise.

Maintenance would be informed by them that blockage to the compressor, such as that caused by the bird, is quite likely to overstress not the first stage of the compressor, but the second stage, due to nonuniform pressure distribution. If the engine was operated for more than five minutes in this condition, it must be removed and sent to overhaul.

How many of the crewmembers would be able to recall with precision how much time elapsed from impact to shutdown? Probably no one could agree *unless they recorded it at the time of the incident* and therefore the engine would have to be pulled. A more thorough knowledge of engine limitations and more data recorded at the time the incident occurred could have prevented this removal.

What can a pilot of a P-3A do to improve his technique in detecting and analyzing inflight engine problems? First, he should improve his knowledge of the basic principles of the T56 engine and keep up to date on its changes and improvements through reading and discussion with his cohorts. Second, he should develop a system of efficiently scanning his engine instruments for evidence of impending malfunction. Third, he should know how to interpret his engine instruments so well that he can analyze the cause of a malfunction almost instinctively and take corrective action prior to the actual failure.

A text on engine theory is beyond the scope of this article, and scanning technique is a matter that will vary from pilot to pilot and according to circumstance, but we can give some basic information to promote trouble analysis.

The P-3A is well equipped to assist the pilot in detecting and analyzing engine problems in flight. It has a complete set of instruments and warning lights which continuously monitor the pulse of each engine. Included in this category are shaft horsepower, fuel flow, turbine inlet temperature, RPM, engine oil temperature and quantity, and gear box and engine oil pressures. Utilizing these instruments, the pilot can compare the performance of the four engines during flight to determine if a problem exists in any single engine.

Except for minor differences in tolerances and age, the T56 engines installed in the aircraft are identical; therefore, the engine instruments should give ap-

proximately the same readings when the power levers are aligned. Large discrepancies between the performance of one engine when compared to the remaining three indicates unsatisfactory operation, and is just cause for concern.

Cross-checking engine against engine to detect unsatisfactory performance is not peculiar to the P-3A, as you well know. This concept was probably implemented by the first multi-engine pilot and it is no less effective today.

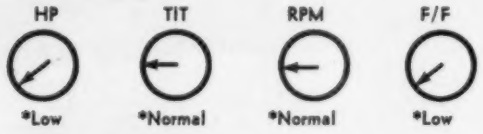
Just how effective is the cross-check principle on the P-3? Well, let's take a few examples to illustrate its value:

Example 1

Situation
1. Low horsepower
2. Low fuel flow

Flight Condition
Takeoff, Climb, Cruise

Cockpit Indications



*As compared to other engines

Probable Cause

Less than normal airflow to the turbine caused by (1) loss of compressor efficiency due to FOD or compressor rub or (2) loss of compressor air through a bleed valve.

Fig. 1

Example 1, Figure 1—Comparison of all four engines shows No. 1 engine to be low on power and fuel flow but RPM and TIT to be normal. This condition indicates less-than-normal airflow to the engine. It could be caused by compressor blockage, such as an overlooked rag or a used seagull in the inlet, compressor rub, or a loss of compressor air through an open bleed valve. First check to see that bleed air is not being extracted from the engine. If there is no apparent bleed loss, record *all* engine instrument readings and include them when the yellow sheet is filled out. If power loss is in excess of 300 hp at takeoff power (150 at cruise) return to the line and find out what the problem is. Bear in mind the 5-minute operating limit mentioned earlier.

Example 2, Figure 2—Consider the case where engine power appears to be normal but fuel flow and TIT are high in comparison to the other engines.

Either a failure in the torquemeter or a loss in turbine efficiency caused by FOD, previous overtemping of the engine or erosion of the turbine is indicated.

Example 2

Situation
1. Normal horsepower
2. High fuel flow and TIT

Flight Condition
Takeoff, Climb, Cruise

Cockpit Indications

*As compared to other engines

Probable Cause

1. Loss in turbine efficiency or burner efficiency caused by damage to the turbine or combustion liners.
2. Torquemeter malfunction.

Fig. 2

The pilot should record horsepower, TIT, fuel flow and RPM for *all* engines when he first notices the problem and continue to record these values from time to time during the flight to insure that the engine is not deteriorating. Report your numbers to maintenance when you return.

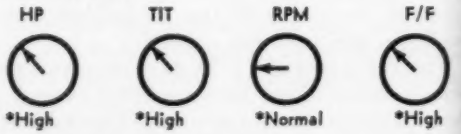
Example 3, Figure 3—What if the power lever on one engine has to be retarded or advanced in order to align its TIT, horsepower and fuel flow schedule to the TIT, horsepower and fuel flow on the remaining engines? Suspect a malfunction in the Temperature Datum system or a misrigged power lever. The T.D. system can be quickly checked by placing the T.D. switches on the suspected engine and on one of the other engines to NULL while operating in the T.D. controlling range and seeing how the power levers line up. If the misalignment remains, a rigging adjustment on the affected engine is probably required.

Example 3

Situation
1. Power lever must be retarded to align TIT with other engines. Fuel flow and horsepower follow TIT.

Flight Condition
Cruise, Takeoff

Cockpit Indications



*As compared to other engines

Probable Cause

Malfunction in the temperature datum system or a misrigged power lever.

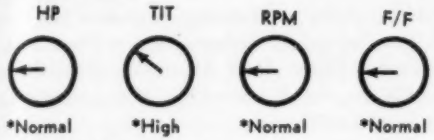
Fig. 3

Example 4

Situation
1. TIT reads high (or low)
2. Fuel flow, horsepower and RPM are normal

Flight Condition
Taxi, Takeoff, Cruise

Cockpit Indications



*As compared to other engines

Probable Cause
1. Thermocouple failure
2. TIT indicating and measuring system failed
3. TIT indicator failed

Fig. 4

Example 4, Figure 4—TIT on an engine is either high or low, but all other engine instruments are satisfactory in comparison to the other engines. Suspect the TIT indicating or measuring system. It is important to *remember that two or more engine instruments will show a discrepancy when a problem is indicated*. You have four major engine sensing instruments on the panel: TIT, RPM, horsepower and fuel flow. These instruments are closely related, and if an engine is normal but is simply operating at a different power setting, it will be reflected in all of these parameters. If only one gage is out of bed, or even if it is completely failed, you can still operate your engines satisfactorily provided the remaining instruments compare favorably with the instruments on the other engines.

The preceding examples show how comparative analysis can help the pilot to recognize problems and understand his engines. A good and accurate source for review of all the troubleshooting procedures applicable to the P-3A is contained in the troubleshooting section of the Powerplant Maintenance Instruction Manual (NavWeps 01-75PAA-2-4), a copy of which is available in your squadron maintenance department.

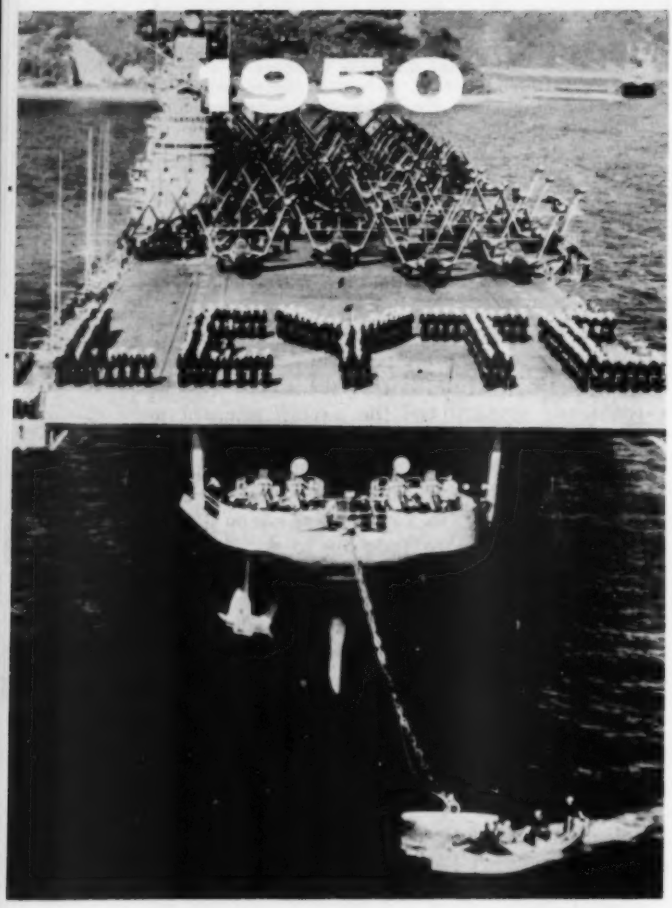
Once an engine problem is detected, if the engine isn't feathered it should be closely monitored during the remainder of the flight. Check continuously to insure that the engine is not deteriorating further. Don't rely on memory; actually record the readings of the engine instruments and compare them with the preceding recorded values. Do not hesitate to shut down an engine as a precautionary procedure. You can always bring the engine back on the line if it is needed. Your aircraft was designed to fly very comfortably on three engines, and the P-3 pilot should have exceptional confidence in his own ability and the ability of his aircraft in respect to engine-out operation after a few hours of 2-engine-out loiter operation.

Finally, we reemphasize the need for foresight and integrity in reporting every pertinent detail of engine trouble to maintenance so that the engine can be expeditiously repaired and the aircraft returned to an up status. Do not spare the details. The more information you give the maintenance people, the sooner they will have the offending system fixed. A write-up stating that "No. 2 engine was low on power" is of little real value to your line crew. This little tidbit of information can mean that the torquemeter is out of calibration, or that the compressor is not putting out enough air, or that turbine efficiency is down, ... Give them specific numbers to work with. Record these numbers when the problem occurs and do not hesitate to report any unusual circumstance which might have contributed to the problem. Relying on your memory is not a good idea since many of the important facts are forgotten during the flight home and are not readily recalled when writing up the problem on the yellow sheet. You will seldom hear a maintenance chief complain of too many details on an engine problem, but you will surely hear him complain if you give him too few.

About the Author

George Davis is a Propulsion Engineer in the Flight Test Division of Lockheed California Company. Prior to joining Lockheed, in 1962, he was a Marine aviator stationed at El Toro. He is currently a member of HMM-764, a reserve squadron at NAS Los Alamitos.

Detailed engine trouble reports will expedite repair and return of aircraft to an up status.



JET THREAT

By George Lechak, ABCM

The year is 1950. An attack carrier is outfitted with 90 aircraft—16 jets and 74 props.

Every man on deck is introduced to the jet threat —FOD—foreign object damage. Only yesterday the term FOD meant "found on deck"—and its main threat was personnel injury. It didn't take long to learn that the jet, with its voracious appetite, would ingest everything from white hats to nuts and bolts—almost anything that was on the loose. Further, they learned the jet became sick and weak with indigestion from these ingestions.

It was realized now that equipment as well as people were hazarded and that extra effort in policing the decks would be necessary to reduce the hazards.

A new set of procedures was written and promulgated. "Flight Deck Operating Procedures," a pamphlet for the V-1 Division of one attack carrier in the year 1950 read:

'Walk-down (Foreign Object Damage/Injury Prevention Program)'

It must be realized that many men work on and about the flight deck. In addition, various pieces of equipment are used in towing and aircraft maintenance. Both personnel and equipment cause loose metal objects to be lost about the deck. Nuts, bolts, washers and safety wire (*now lockwire, shearwire—Ed.*) can cause serious damage to jet engines or injury to personnel. Therefore, each day the aircraft handling crews, Repair Eight and tractor drivers shall proceed to and form a line across the bow. Each man shall pick up all objects on the deck and in pad-eyes as the line slowly walks toward the stern. Never throw objects *found on the deck* over the side to be blown back onto the deck or directly into jet engines. One man shall carry a container for depositing these items for collection and inspection by the Flight Deck Officer. Causes shall be determined and remedies found for elimination of controllable loose metal objects.

Loose Wood Screws From Aircraft Chocks—Repair Eight shall constantly inspect chocks in service and tighten all wood screws and moving parts.

Safety Wire Dropped During Aircraft Maintenance—Plane captains are responsible for the area around their aircraft, in port and at sea, and shall constantly check for loose metal objects. Maintenance crews shall never allow a dropped metal object to remain on deck.

Throughout the ship everyone became aware of the new problem. Ship's instructions contained more information and regulations. Items such as dumping trash from the fantail *only*, no personal gear in your pockets, removing your hat while observing flight operations from the island structure, and other com-

mon sense rules were more strictly enforced.

Everyone became part of the program. Now, the possibility of jet engines chewing up white hats floating down from the island structure or used office supplies carried up over the deck edge by the wind was greatly reduced.

Then, 60 men were assigned to the V-1 division. They operated with these 74 whirling props and the 16 "stovepipes" aboard. They needed and received plenty of help in keeping the deck squared away. Plane captains and maintenance personnel knew what was demanded of them and the flight deck game was played by the rules.

The hangar deck received plenty of attention also. Sloppy maintenance practices could not be tolerated. Regular sweepdowns were a must. It was known that a tractor, support equipment or an aircraft tire tread would pick up and carry FOD to the flight deck.

On the flight deck, the program was stressed to the point whereby it became automatic to pick up these objects. It was understood by all hands that a nut, bolt, or washer Found On Deck and brought to the attention of the flight deck officer was far better than treating an injury or repairing a damaged aircraft.

The year is 1965. The year of the jet carrier. An attack carrier is operating with 90 aircraft—85 jets and 5 props. There are about 120 men assigned to the V-1 division. They operate with these 85 high-thrust jet-powered monsters and stay well clear of the 5 whirling props.

The game on deck is far faster and hotter today but the basic rules still apply. Responsibilities must be assigned and assumed. Everyone must be part of the program. A nut, bolt, or washer Found On Deck and picked up will not cause injury or damage.

Complex flight deck operations of today require alert personnel who can recognize problem areas as they develop and come up with remedies, just as in the past.

This is what is included in one of today's attack carrier's foreign object damage/injury prevention program in order to supplement the efforts of ships company and airwing personnel:

"A two-man FOD team shall be assigned, by schedule, from squadrons attached to the ship, to patrol the flight deck. It shall be their job to police the flight deck, and collect all objects in a canvas bag and deliver them to the CAW maintenance chief."

Many changes have occurred in the past 15 years.

Over a 15-year span the meaning of FOD changed significantly as did the carrier's complement of aircraft: 1950: 90 aircraft, 16 jets, 74 props; 1965: 90 aircraft, 85 jets, 5 props.

An aircraft carrier's crew must keep abreast of these changes and build upon the well proven procedures of the past which were developed through much hard work and by utilizing common sense.

Remember that much FOD is generated by the people. These people are the pilot, plane captain, maintenance man and everyone else who is assigned to the ship, *including* the skipper. Therefore, it is not possible to itemize every potential FOD threat or how all FOD is generated or every means needed for FOD control. But, it can be stated, unequivocally, that FOD generated by people can only be eliminated by people.

NATO Symbols

Aviation fuels, lubricants and specialty products used by the NATO armed forces.

NATO numbers allotted to petroleum products have been ratified by the U. S. armed forces. BuWeps Instruction 10300.1C of 2 Nov 1965 states: No product is allotted more than one NATO number and a number once assigned is never used for any other product. These numbers appear on all aircraft, containers, and ground equipment such as refuelers. NATO numbers are clearly distinguished from all other markings by being enclosed in a rectangle.

Personnel concerned with supplying or servicing U. S. Naval aircraft and with the cross-servicing of NATO aircraft should refer to the BuWeps Inst 10300.1C for detailed guidance.

A listing of NATO symbols and product description is offered here for ready reference.

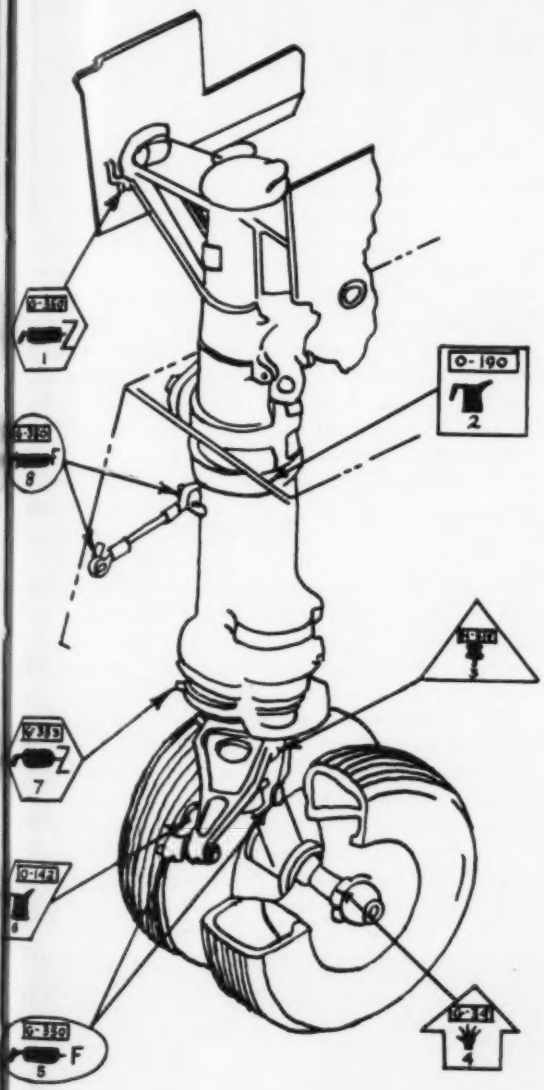
Application Method Symbol

OTHER METHODS

*THE APPLICABLE FITTING SYMBOL WILL BE ATTACHED.

**A NOTE REFERENCE NUMBER WILL BE PLACED IN THIS POSITION. THE NOTE WILL EXPLAIN SPECIAL REQUIREMENTS.

F-12	Gasoline, Aviation Grade 80/87
F-18	Gasoline, Aviation Grade 100/130
F-22	Gasoline, Aviation Grade 115/145
F-34	Turbine Fuel, Aviation Kerosene Type (with Fuel System Icing Inhibitor) (S-748)
F-35	Turbine Fuel, Aviation Kerosene Type (without Fuel System Icing Inhibitor) (S-748)
F-40	Turbine Fuel, Aviation Wide Cut Gasoline Type (with Fuel System Icing Inhibitor) (S-748)
F-42	Turbine Fuel, Aviation High Flash Kerosene Type
F-44	Turbine Fuel, Aviation High Flash Kerosene Type
F-45	Turbine Fuel, Aviation Wide Cut Gasoline Type (without Fuel System Icing Inhibitor) (S-748)
O-113	Lubricating Oil, Aircraft Piston Engine Grade 1065
O-117	Lubricating Oil, Aircraft Piston Engine Grade 1100
O-123	Lubricating Oil, Aircraft Piston Engine Grade D-1080 Dispersant
O-125	Lubricating Oil, Aircraft Piston Engine Grade D-1100 Dispersant
O-128	Lubricating Oil, Aircraft Piston Engine Grade D-1120 Dispersant
O-132	Lubricating Oil, Aircraft Turbine Engine, Petroleum Grade 1005
O-133	Lubricating Oil, Aircraft Turbine Engine, Petroleum Grade 1010
O-134	Lubricating Oil, General Purpose
O-135	Lubricating Oil, Aircraft Turbine Engine, Petroleum
O-136	Lubricating Oil, Aircraft Turbine Engine, Petroleum
O-138	Lubricating Oil, Aircraft Turbine Engine, Petroleum
O-140	Lubricating Oil, Aircraft Controls
O-142	Lubricating Oil, General Purpose Low Temperature
O-147	Lubricating Oil, Instrument: Synthetic
O-148	Lubricating Oil, Aircraft Turbine Engine Synthetic 3.0 cs.
O-149	Lubricating Oil, Aircraft Turbine Engine Synthetic
O-153	Lubricating Oil, Gear: Aircraft Light Grade
O-155	Lubricating Oil, Gear: Aircraft, Medium Grade
O-156	Lubricating Oil, Aircraft Turbine Engine, Synthetic 5 cs.
O-157	Lubricant Oil, Low Temperature, Weapons
O-158	Lubricant Oil, Semi Fluid
G-350	Grease, Aircraft Synthetic General Purpose
G-352	Grease, Aircraft Synthetic, Extreme Low Temperature
G-353	Grease, Aircraft Synthetic, Molybdenum Sulphide
G-354	Grease, Aircraft Synthetic, Extreme pressure
G-355	Grease, Aircraft Graphite
G-357	Grease, Aircraft Graphite
G-359	Grease, Aircraft High Temperature
G-361	Grease, Aircraft Synthetic, Wide Temperature



NOSE LANDING GEAR
SAMPLE LUBRICATION CHART

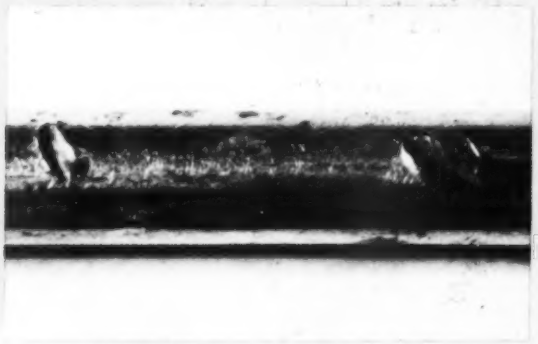
G-363	Grease, Plug Valve, Hydrocarbon Resistant
G-366	Grease, Aircraft Helicopter Oscillating Bearing
G-372	Grease, Aircraft Synthetic High Temperature
G-382	Grease, Aircraft General Purpose
G-392	Grease, Aircraft Synthetic: Pneumatic System
G-394	Grease, Aircraft Silicone: Pneumatic System
H-515	Hydraulic Fluid, Petroleum
H-535	Hydraulic Fluid, Petroleum: Missile
C-608	Corrosion Preventive Oil, Aircraft Engine, Concentrate
C-609	Corrosion Preventive Oil, Aircraft piston Engine
C-610	Corrosion Preventive Oil, Aircraft Turbine Engine
C-612	Corrosion Preventive Oil, Aircraft Engine Static Preservation
C-613	Corrosion Preventive Oil, Aircraft Engine Static Preservation
C-614	Corrosion Preventive Compound: Soft Film, Cold Application
C-615	Corrosion Preventive Oil, Aircraft Engine Piston, Metallic
C-618	Corrosion Preventive Compound: Hard Film, Cold Application
C-620	Corrosion Preventive Compound: Soft Film, Cold Application
C-627	Corrosion Preventive Compound: Soft Film, Hot Application
C-628	Corrosion Preventive Compound: Soft Film, Hot Application
C-629	Corrosion Preventive Compound: Hard Film, Cold Application
C-630	Corrosion Preventive Compound: Thrust Augmentation Fluid
C-632	Corrosion Preventive Compound: Hard Film, Cold Application
C-633	Corrosion Preventive Compound: Hard Film, Hot Application
C-635	Corrosion Preventive Compound: Hydraulic Systems
C-637	Corrosion Preventive Compound: Hydraulic Systems
C-638	Corrosion Preventive Oil, Aircraft Turbine Engine, Synthetic
S-712	Compass Fluid, Aircraft Petroleum
S-717	Antiseize Compound, Aircraft, Oxygen Systems
S-718	Antiseize Compound, Aircraft, Oxygen Systems
S-720	Antiseize Compound, Aircraft, Graphite Petrolatum
S-725	Antiseize Compound, White Lead
S-732	Graphite Powder
S-735	Antifreeze, Aircraft Engine
S-736	Insulating Compound, Electrical
S-737	Isopropanol, Technical
S-738	Ethanol, Denatured
S-740	Molybdenum Di-Sulfide, Technical
S-742	Deicing—Defrosting Fluid, Aircraft Surfaces
S-743	Petrolatum, Technical
S-745	Deicing—Defrosting Fluid, Aircraft Surfaces
S-746	Isopropyl Nitrate, Starter Fuel
S-747	Methanol, Technical
S-748	Fuel System Icing Inhibitor
S-749	Lubricant Solid Film, Air Drying
S-1712	Damping Fluid: Dimethyl Silicone 3-cs.
S-1714	Damping Fluid: Dimethyl Silicone 10-cs.
S-1718	Damping Fluid: Dimethyl Silicone 50-cs.
S-1720	Damping Fluid: Dimethyl Silicone 100-cs.
S-1724	Damping Fluid: Dimethyl Silicone 7,500-cs.
S-1726	Damping Fluid: Dimethyl Silicone 20,000-cs.
S-1728	Damping Fluid: Dimethyl Silicone 100,000-cs.
S-1732	Damping Fluid: Dimethyl Silicone 200,000-cs.
S-1735	Molybdenum Disulphide, Lubricating Oil, Silicon Base
P-912	Propellant, Nitric Acid
P-920	Propellant, Ethylene Oxide
P-922	Propellant, Unsdimethyl Hydrazine
P-923	Propellant, Unsdimethyl Hydrazine/Turbine Fuel Aviation, Wide Cut Type

DON'T

By J. A. Barton
Ling-Temco-Vought, Inc.

The use of tension springs throughout the various systems of a modern jet aircraft would seem to present no problem. Springs have been used since Wilbur and Orville broke the heavier-than-air barrier and the state of the art has increased concurrently with the varying requirements.

The spring is perhaps the most reliable mechanical device in the system and is often the most abused. Often, springs are located in an area that is hard to reach, and the installation tools that are used are generally incompatible.



Spring wire damaged by a pair of dikes.

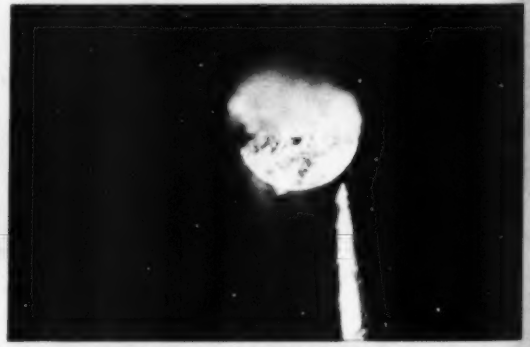
The usual mechanic's tool used to install a tension spring is a pair of diagonal wire cutters (dikes). They are small, easy to use, won't slip and are a common piece of equipment, usually carried by the mechanic. To install the spring, you attach one end of the spring, then grasp the shank of the other end of the spring with the dikes; a turn of the wrist and the spring is attached.

Is there harm in using this handy tool? Yes! There are serious consequences to this practice. The dikes have two sharp edges which bite into the metal of the spring (illustrated at left). This weakens the spring by reducing the cross-sectional area so that the rated strength is impaired. Another spring installation device is the common plier. The sharp edges on the non-slip face of this tool will also damage the spring. The problem, however, when using this tool, is that the sharp edge of the side of the tool damages the shank of the spring when the wrist is bent to attach the spring.

The reduction in area then causes a stress concentration so that a failure can progress (see photos below). To complicate the problem even more, assume that the dikes were applied to the bend on the shank of the spring. This bend is a stress point but engineered so that it will not fail during the normal life of the spring. Abuse in this area will quickly reduce the life of the spring by inducing stress concentration in the highest stressed area.

The majority of springs which are now used are made of stainless steel or cadmium plated wire so that corrosion is not the problem as it once was; however, any marring, scratching or cutting of the cadmium surface of the spring allows corrosion to occur.

Never use dikes and don't use any tool which will cut or mark the surface of the spring during installation. If any of the several types of pliers are to be used, the plier jaws must be covered with tape.



Fracture surface of spring wire indicates primary fatigue failure.

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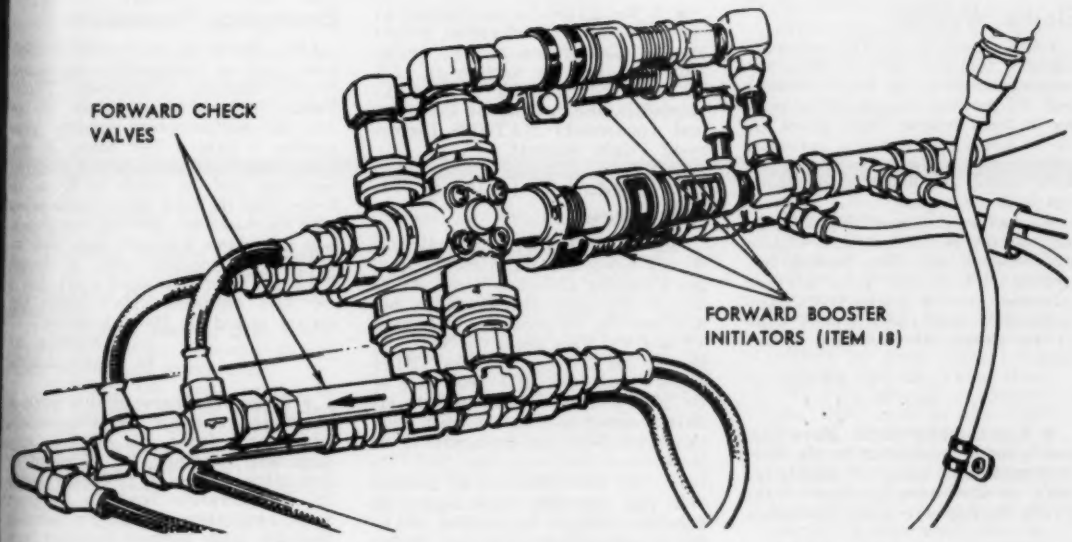
MURPHY'S LAW *



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T-2A Murphy

DURING acceptance checks of two T-2A aircraft, reversed installations were discovered in the ejection seat mechanisms. Had ejection been initiated from the rear cockpit, the front seat would not have fired sequentially.

In each case the upper T-31-E2 forward booster initiator (Ref. NavWeps 01-60GAA-4, Fig. 144, item 18), mounted on the command selector valve PN 49964 was installed reversed, having *inlet* lines PN R02982-0040 connected to the *outlet* port of the initiator.

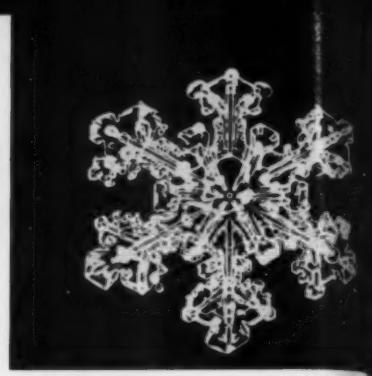
Reversed installation is made possible by the fitting on either end of the initiator being of the same size when union PN AN 715-4D is installed on the initiator.

To insure correct installation of this component, reference should be made to Fig. 4-220 of NavWeps 01-60GAA-2-4.

—*Contributed by VT-9*

*** If an aircraft part can be installed incorrectly, someone will install it that way!**

LETTERS



Want your safety suggestion read by nearly a quarter of a million people in naval aviation? Send your constructive suggestions to APPROACH.

Elastic Wristlet

NAAS, Ream Field—This command conducts frequent survival equipment swimming drills in the local swimming pool. Of growing concern is the number of times summer flight gloves are lost or nearly lost during a swimming attempt. The loose wristlets act as water scoops and hasten glove separation from the wearer.

A coincidental review of past AARs indicates this as a trouble area wherein an attempt to swim from burning fuel resulted in immediate glove loss and subsequent second degree burns. Recommended was an elastic type of wristlet to prevent the scooping action. Status?

JAMES L. LOVEJOY, LT
ASO, HS-10

• The summer flight glove currently being evaluated by the fleet incorporates a piece of elasticized tape on the inner surface of the wrists to improve glove retention.

IFR Fuel Requirements

NAS Miramar—The December issue of APPROACH makes much of the rather insidious fact that any consideration given a destination on an IFR flight plan should certainly be given the alternate. This oft forgotten viewpoint is heartily endorsed, but the fuel requirements implied by the article require amplification for clarity.

OpNavInst P3710.7B states that "All aircraft shall carry sufficient fuel to fly from the takeoff point to preplanned altitude over destination, and thence to alternate, if one is required, plus 10 percent."

By regulation, therefore, no aircraft need add penetration or approach fuel needed at destination (or alternate) into a flight plan. Certainly, common sense would dictate an additional margin of fuel in the event an actual missed approach was anticipated, but P3710.7B correctly leaves this option up to the individual.

V. R. HUBKA
CO, VF-126

• A NavAvnSafeCen attendee at recent NATOPS Instrument Flight Manual Conference in San Diego indicates that the section on IFR jet fuel requirements will be expanded in the rewrite of the original (proposed) NATOPS Instrument Flight Manual.

Mk 13 Mod O Training Allowance

Virginia Beach, Va.—ComNavAirLant Weekly Safety Bulletin 171803Z authorizes a training allowance of two Mk 13 Mod O day/night distress signals per pilot per year for squadrons other than VP and VS. What about the NFO who flies in the F-4B, A-5, A-6A? After ejection must the NFO swim over to the pilot and ask him to activate his distress signal or does the pilot swim over to the NFO? Seriously, what is the word.

TWO PHANTOM PHERRET MOUSES

• You will find your answer in ComNavAirLant Instruction 0811.-3A (Confidential), Ordnance Training Allowance for FY 66.

Safety Award Contender

FPO, New York—Your attention is invited to the fact that there is no such thing as the Helicopter Composite Squadron FOUR, referred to in an article on page 24 of the December issue. The AirLant contender for the 1965 CNO annual readiness through Safety Award is correctly: Helicopter Combat Support Squadron FOUR, abbreviated HC-4.

W. C. SHARPE
CO, HC-4

• Our goof. Thanks for setting us straight.

APPROACH welcomes letters from its readers. All letters should be signed though names will be withheld on request. Address: APPROACH Editor, U. S. Naval Aviation Safety Center, NAS Norfolk, Va. Views expressed are those of the writers and do not imply endorsement by the U. S. Naval Aviation Safety Center.

Emergency Procedures

FPO, Seattle—Your December 1965 issue had an outstanding Anymouse article entitled "Proficiency Pilots' Peril." Of particular interest to me was the malfunctioning landing gear portion. I have a few hours in the trusty Bug Smasher, including over 100 test hops, and the article leads me to believe that the pilot wasn't too familiar with his emergency landing gear extension procedures. I haven't been able to refresh my memory with a *Beech* NATOPS manual (isolated area), but I feel sure Anymouse didn't follow the correct procedure. How about it?

J. D. HOWELL, LT
NS ADAK, ALASKA

• Since Anymouse didn't give a complete rundown on his emergency procedures, it's hard to say definitely whether he skipped a few steps. However, two comments in his narrative tend to support your contention. First he relates that the main mounts dropped into place. This could be taken to indicate that the gear was not in fact cranked to the full-down position. Secondly, he mentions the warning horn sounding at idle power, referring to it as a "problem."

Here is the complete procedure for emergency landing gear operation, as stated in the NATOPS Pilot's Checklist (C-45).

(1) If the Gear does not operate electrically:

1. Reset the landing gear and landing gear control circuit breakers.

2. Check generators ON and operating.

3. Try lowering the gear again, electrically.

(2) If Gear still does not go down:

1. Pull landing gear and landing gear control circuit breakers.

2. Check airspeed below 108 kts.

3. Landing Gear Handle—DOWN.

AUTOMATIC TERMINAL INFORMATION SERVICE (ATIS)

ATIS is the continuous broadcast of recorded noncontrol information in selected high activity terminal areas. It improves controller effectiveness and relieves frequency congestion by automating repetitive transmissions of essential but routine information.

Ceiling, visibility, wind, altimeter, instrument approach and runways in use are continuously broadcast on the voice feature of a TVOR/VOR/VORTAC located on or near the airport, or broadcast on a discrete VHF tower frequency.

Pilots arriving at or departing the terminal area can receive the continuous ATIS broadcasts at times when cockpit duties are least pressing and listen to as many repeats as desired.

ATIS broadcasts will be updated when there is a significant change in information. Terminal controllers will issue pertinent information to pilots who do not acknowledge receipt of the ATIS message, or who acknowledge receipt by an alphabet code word not current.

Pilots are urged to cooperate in the ATIS program since it relieves frequency congestion on approach control, ground control and local control frequencies.

Airport locations at which ATIS is available are indicated in Section IV-A of the *Airman's Information Manual.*

---

4. Landing Gear Crank—FREE.

5. Raise landing gear clutch pedal cover; depress and hold clutch. Gear will drop to a trailing position.

6. Engage landing gear handcrank by pulling inboard (away from pilot) and lower gear.

7. When the crank cannot be turned further, release clutch and rock handcrank until clutch pedal returns to normal position.

8. Check gear DOWN and LOCKED, using the following checks:

Cross-Shaft Teeth—MESHED.
Light—OUT.
Horn—OFF.
Visual Check.

Notam Maze

FPO, New York—During the past year or so I have become increasingly disillusioned with the current notam system. On two occasions recently I have been rudely shocked upon encountering conditions at destination airfields that were not depicted on the notam board at my takeoff point. Seems to me that the system needs a thorough re-evaluation. The problem seems to be universal throughout ConUS.

WARY NOTAM MOUSE

• The current notam system is, to the best of our knowledge, an efficient and accurate method of getting the word out. A local survey of pilots indicates that part of the problem may stem from incorrect or only partial use of the system.

The following is an excerpt from an article published in the April 1963 issue of

"When the Central Notam Facility receives a Notam, they immediately screen it to see that it is in standard language and complies with notam criteria to eliminate non-essential information. Within a half hour it is on the circuit to the operations officer at every Naval Air activity and Air Force Base. The next step is to correct the IBM card in the CNF file of Temporary Notams, so the next 12-hour summary will be correct. If a notice is to be in effect for over 30 days it will be run as a Temporary Notam until the following Saturday morning when it is incorporated into the ACIC Notams (FLIP changes). The people at ACIC then make FLIP corrections and when the new publications become effective, it is no longer transmitted as a ACIC Notam."

Remember, you have not (completely) checked notams unless you have seen:

- **Base notams**
- **FLIP changes**
- **Enroute Supplement remarks and Special Notices**
- **FLIP Planning—Section 1 Special Notices for destination and alternates**

Plus enroute

- **General notams**
- **FAA notams**

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Vol 11 **approach** No 8

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SH-3D on target. Cover painting by Ray Ramsey, courtesy Sikorsky Aircraft, Division of United Aircraft, Hartford, Conn.

Page 40 Photo Courtesy NANews

Page 44, IBC photo by Art Schoeni, Courtesy Ling-Temco Vought, Dallas, Tex.

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WELL DONE

CAPT M. W. Lutes, USMC
VMF(AW)-212

Captain Lutes was catapulted from his carrier to test-fly an F-8E. After leveling at 40,000 ft, he made two unsuccessful attempts to go into afterburner. A third attempt was made at 30,000 ft. Again, no luck. At this point he came back to 90 percent, observed a continuing decrease in RPM, and subsequently experienced a flameout.

The initial airstart at 25,000 ft (normal fuel control) was successful. After light-off, RPM climbed to 90 percent and stabilized. Subsequent throttle modulation indicated a mechanical failure. With the throttle against the idle detent, RPM remained between 89 and 91 percent.

Considering the previous flameout and lack of RPM control, Captain Lutes diverted to a land base, intending to use the procedure outlined in NATOPS for a "Hung Throttle Landing."

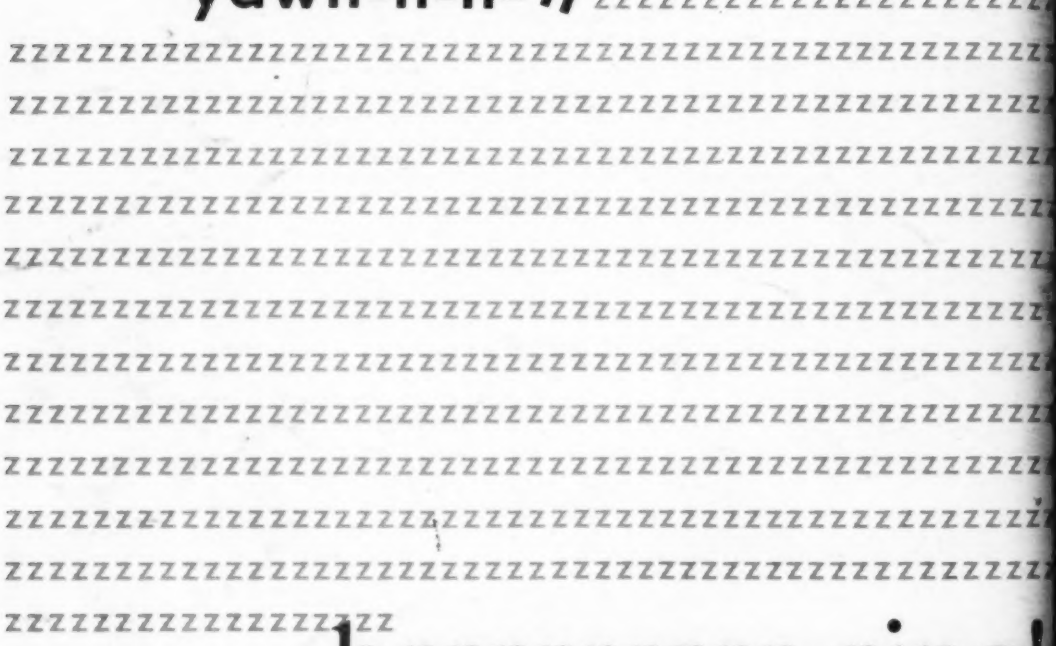
While on the downwind leg at 1000 ft, Captain Lutes observed his RPM to be holding steady at 87 percent. Using speedbrakes for speed control he flew the *Crusader* through the "Hoop" at 170 kts and 300 ft of altitude. About 4000 ft from the approach end he turned off the engine master switch, and just before touchdown, retracted the speedbrakes. The engine flamed out after 3000 ft of rollout. Arresting gear was not needed. Captain Lutes coasted to the end, turned off onto the taxiway and stopped.

After learning of this incident, one Force Standdardization Officer likened it to a "breath of clean country air." "Unfortunately," he continued, "there are still too many people around that think NATOPS applies only to a training outfit, stops with standardization check, doesn't apply to staff pilots, is the other guy's worry and last but not least, will go away if you leave it alone."

Reports like this indicate that the word may be getting out, and that NATOPS procedures are applicable to any type of operating environment.

Again, "Well Done" Captain Lutes.

yawn-n-n-n zzzzzzzzzzzzzzzzzzzzzz



brrrrrrrrr-ring!

...restful, uninterrupted sleep.
Try and get your quota daily!

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